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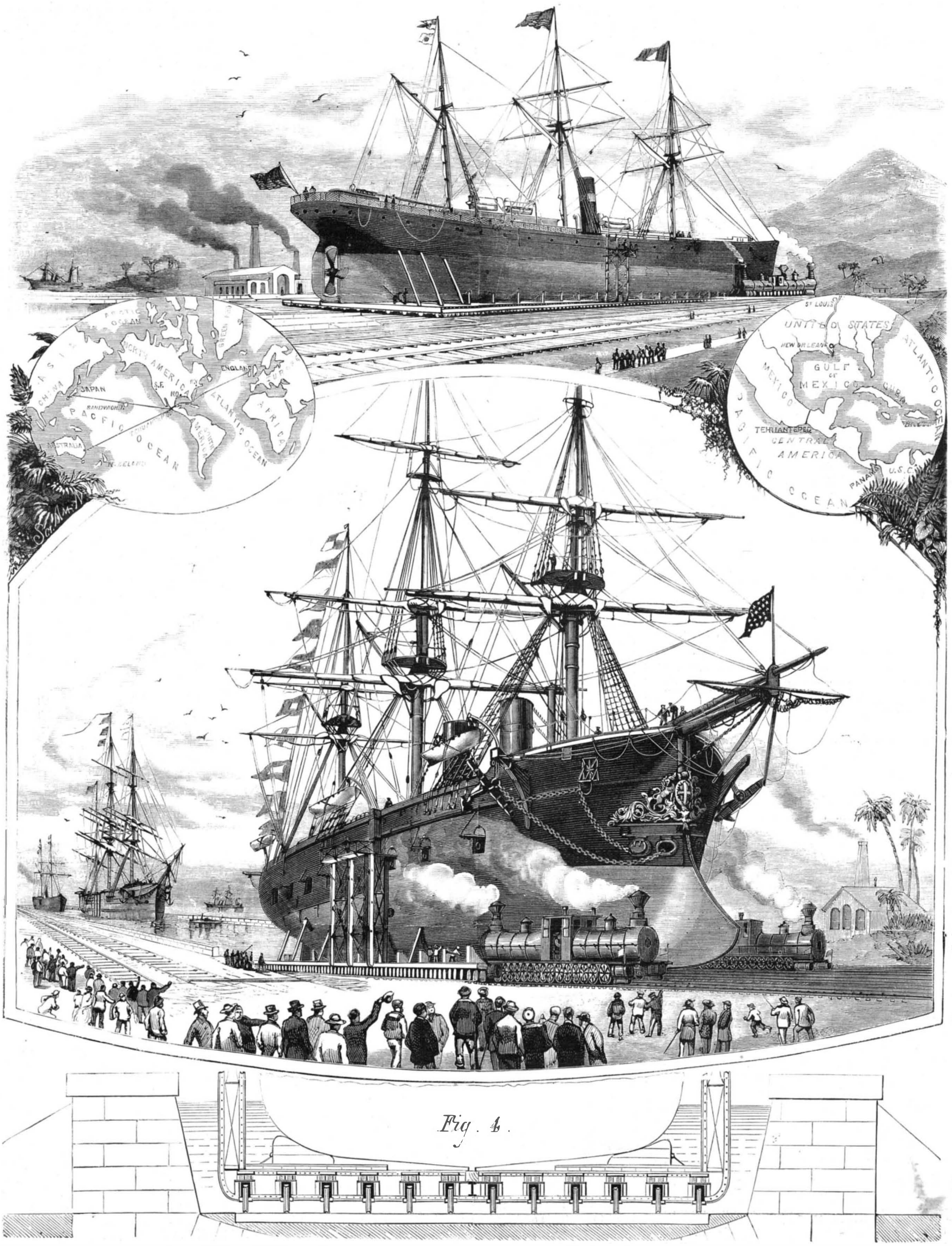

MR. EADS' GREAT SHIP RAILWAY FOR THE AMERICAN ISTHMUS.—[See page 308.]

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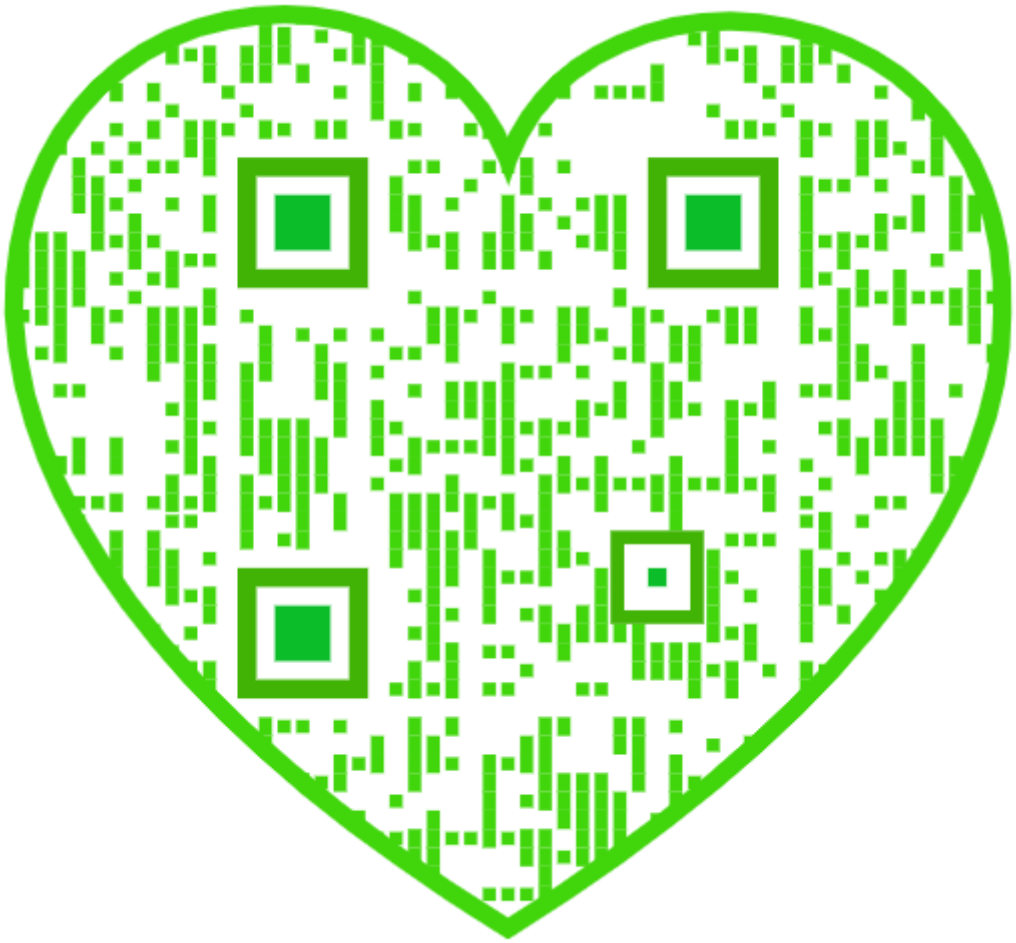

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THE PROSPECTS OF TRADE.

On all sides the business outlook is of the most cheering character. The statistics of the Treasury Department show that during the nine months ending with September the total exports of breadstuffs was in round numbers nearly $209,000,000, or over $30,000,000 more than during the corresponding period last year. The exports of domestic provisions during the same period approached $104,000,000, against $82,000,000 for the same months last year. The total exports of domestic manufactures and merchandise of all sorts during the first eight months of the current year exceed those of the same period last year by more than twenty per cent; and the general conditions of trade during the latter part of the year—for which the full statistics are not at hand—certainly indicate no falling off in the ratio of increase. The increase in the value of goods imported this year is greater than the increase in exports; while the steady inflow of gold from Europe is proof enough of the healthful condition of our foreign trade as a whole.

Our domestic trade was never being prosecuted with greater vigor, confidence, and profit. The great lines of communication are taxed to the uttermost to handle the merchandise now in motion. The trunk lines of railway report their western bound freights to be from 25 to 40 per cent greater than this time last year, while the eastward movement is fully 10 per cent above that of the corresponding period in 1879, with the heaviest parts of this year's crop yet to be moved. The coastwise trade is likewise reported as considerably in excess of last year's.

Not less cheering are the reports from manufacturing centers, East, West, and South. The mills and factories are running full time and full handed, and critical observers note as a source of special gratification that at no time since the war has there been so great a demand for tools and machinery required in extending old established works and for equipping new ones. The manufacturers of tools, machinery, and other appliances for manufacturing are crowded with orders, indicating not merely a present active demand for manufactured products for general consumption, but a confident expectation on the part of producers of increasing demands in future.

Even so conservative an authority as the United States *Economist* does not hesitate to say, what we had the pleasure of asserting more than a year ago, that the country has entered upon a period of productive energy and prosperity such as it has never seen before. In the words of our contemporary, the best ten years in all the history of this country are now before us. During the coming decade we shall enjoy a period unexampled prosperity, a prosperity whose foundations are as real and whose basis is as broad as the unequaled products of our fields, flocks, factories, and mines.

"With our currency on a specie basis, with our population steadily increasing through the active toilers of foreign immigration, with vast areas of rich virgin soil being constantly added to our productive growth, with all our vast industries in successful operation, with the balance of trade in our favor, with peace at home and abroad, with labor steadily employed and wages good, with the wealth of the nation rapidly augmenting, there is no bar in the way of our commercial advancement. All obstructions are happily removed, and taking care of home wants and developments, let the business men of this country reach out for the commerce of the world."

As we remarked in a recent issue of the SCIENTIFIC AMERICAN the closing years of this century should see, and certainly promise to see, as rapid a progress toward American commercial supremacy as the two decades just past have seen in the development of our agricultural and mechanical supremacy, with a collateral progress in our industrial affairs that the boldest scarcely dream of now.

PROPOSED PALM OIL INDUSTRY.

Mr. Edward S. Morris, of Philadelphia, suggests that something profitable might be done in this country in the extraction of palm oil by means of naphtha. While in Hamburg, Germany, lately, he found three factories running night and day extracting oil from palm kernels, and tried to gain admission to them. He was not admitted, the Germans thinking that Americans know quite enough, and that we will soon undersell them under every business head. He learned, however, that the oil was extracted from the kernels by naphtha, and not by hydraulic pressure. Most of the oil thus made goes to France, where it is refined and made into a fine table oil. Labor is so cheap in Germany that they can afford to throw the meal away after extracting the oil. If the oil was obtained by pressure, then the meal or cake would have the same market value as linseed cake, as food for cattle.

At Liverpool he learned that palm oil and palm kernels formed about two-fifths of the entire tonnage of more than twenty steamers trading along the African coast to and from Liverpool. The exportation of palm kernels from Africa began only a few years since. They now have a regular market value and a ready sale in England, where the oil is mostly purchased by soap makers and perfumers. There the oil is extracted by pressure, and the cake or meal finds a ready sale, being free from the odor of naphtha.

Believing that the industry might be profitably introduced here and the importation of palm kernels made a useful adjunct to the trade of American vessels visiting the African coast, Mr. Morris brought home three tons of the kernels purchased in Liverpool. He sent samples to several parties likely to have facilities for extracting the oil, but found no one ready to undertake the work. He is still confident that the industry could easily be established here, and that it would pay. Seeing, however, that we have only begun to utilize the equally valuable oil of our enormous yield of cotton seed, there does not seem to be much probability of any rapid increase in the importation of African palm kernels for their oil. It might be a profitable thing to do, nevertheless. The objection to the naphtha process, that it leaves an odor of naphtha about the oil cake, is, we are inclined to think, unfounded in fact. At any rate, the taint must be rapidly dissipated on the exposure of the meal to free currents of air.

THE EFFECT OF FORESTS UPON RAINFALL.

The effect of clearing land of its trees, according to the opinion of many meteorologists, engineers, and other scientific students of the subject, is to diminish the average rainfall of the country thus cleared, to lessen the outflow of the rivers, and also to cause such concentration of the amount of rain and snow within short periods as to increase the danger of floods to a marked extent. This theory was formulated most fully in 1873 by Sir Gustav Wex, chief engineer of the improvements in the Danube River at Vienna, who supported his opinion by very ample calculations as to the decrease in the volume of water discharged by the five principal rivers of Central Europe. Since that time many opinions have been expressed by experts, some affirming, others denying, the correctness of Sir Gustav's theory; some have claimed that the fact of such a decrease in the discharge of the rivers cited has not been satisfactorily established; while others, admitting that the decrease has gone on, deny that this fact is sufficient to prove the accuracy of all, or even any of Sir Gustav's conclusions. The latter has, therefore, recently published a second treatise, in which he says that for six years he has shunned neither labor nor expense in obtaining as many and as reliable technical hydraulic measurements and data of different streams as possible; and he has come to the conclusion that his theory has been proven to be correct.

Sir Gustav gives voluminous tabular exhibits of observations taken on a number of large rivers extending over periods of more than 100 years in some cases, and in nearly every case it is found that the river surface has been lowered to a marked degree. The rivers cited are the Upper and Lower Rhine, the Danube, the Elbe, the Vistula, the Oder, the Moselle, the Main, the Theiss, the Tiber, the Po, the Seine, the Glommen (in Norway) and the Mississippi. In reply to the objection that the lowering of a river's surface may be due to the deepening of its channel, and not to the decrease in the volume of water discharged, Sir Gustav admits that the channel beds are sometimes raised and sometimes lowered; "but," he says, "if from the numerous gauge readings submitted by me are eliminated those which were taken on stretches of the stream in which changes in the bed of the river took place, we will still find some rivers or stretches of stream which lie either in a natural unchangeable bed, or which have been improved from time immemorial and are in permanent condition. The most scrupulous expert must admit that on such rivers and stretches we can justly assume that the decrease in their stages—*i. e.*, the sinking of their surface, indicates a decrease in their volume of water, since it would be impossible to explain the phenomenon in any any other way."

Sir Gustav claims that the destruction of forests, necessarily coincident with the advance of civilized habitations into new countries, not only diminishes the aggregate amount of rainfall, but it increases the tendency of floods. This is, of course, equivalent to saying that the rainfall (which word includes all atmospheric aqueous deposit, such as rain, snow, hail, dew, etc.) is concentrated into briefer spaces of time during the year, instead of being equally distributed; and as this concentration must have a detrimental influence upon agriculture, the importance of the subject extends beyond its effect upon rivers alone, which is the only point of view taken by Sir Gustav Wex. It therefore deserves double attention in this country, where droughts are so often such serious causes of crop failures.

The observations of the Mississippi recorded by Sir Gustav were made at Natchez, Miss., and extended over a period of 11½ years. They showed a mean annual fall of seven-tenths of an inch in the surface level of the water, while the highest stages averaged nine hundredths of an inch higher each year, and the lowest stages thirty-nine hundredths of an inch lower each year.

THE BRUNTON TUNNELING MACHINE.

The Society of Associated Coal Miners, of the Bouches du Rhône, in the south of France, have long had in view the cutting of a tunnel nearly ten miles long between their mines in the basin of Fuveau and the sea. During the last three years they have made many experiments with machinery intended for tunneling, at an aggregate expense of about $40.000. There are serious objections to the use of explosives for removing the rock, and recently they have made some trials with the tunneling machine of J. Dickinson Brunton, invented for the purpose of cutting the tunnel beneath the Channel. The machine consists of revolving cutting disks placed at different angles, and so directed as to remove the rock in considerable quantities directly without the use of explosives. Mr. Brunton estimated that in a tunnel of 7¼ feet in diameter, he could progress at the rate of about two feet an hour through calcareous rock.

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The experiments by the French company were made in a mine at Gardanne, where a tunnel 800 meters (or half a mile) long had already been pierced. The motive power was at a distance of one-quarter of a mile from the mouth of the tunnel, and the power was conveyed to the Brunton machine by an endless chain.

The first trials were devoted to determining the best form for the cutting disks, and, although the life-time of those first used was only during one foot of advance, the form was so improved upon that they finally lasted during a progress of fifteen feet. It was then found that the machine did not work in a straight line, but would vary its direction and seriously strain the machinery. This was overcome by using the spirit level and other means of rectilineation. The improved machine was then tried for effectiveness, and, although its progress was satisfactory, it hardly came up to the sanguine anticipations of the inventor. In the best trials the progress made varied between 4¾ inches and 6½ inches per hour. It was evident that the motive power transmitted was insufficient. Investigations upon this point brought out that of the 51 horse power of the original motor, only 12·4 horse power were transmitted to the tunneling machine, leaving a net loss of 38·6 horse power. Unquestionably if this large loss can be avoided the progress of the machine through the rock will even surpass the expectations of Mr. Brunton.

INFECTED CIGARS.

The occurrence of occasional cases of syphilitic sore mouth, among cigar smokers unwilling to admit any other source of contagion than the cigars they use, gives rise from time to time to sensational and possibly alarming newspaper reports of cigar smokers' perils. Several articles of this character are now before us. To one who does not smoke cigars the alleged perils from syphilitic taint seem to be grossly exaggerated, for two reasons: cigar smoking is extremely common among respectable people, on the one hand, and, on the other, the disease in question (syphilitic sore mouth) is by no means common among such people; while the probability that the relatively few victims who charge cigars with their misfortune may have been infected in some other way is certainly not small. The assertions of sensational reporters refute themselves by trying to prove too much.

Nevertheless it must be admitted that the indiscriminate smoking of cigars without the intervention of a holder is not a nice practice, especially when we take into account the large number of cigars made by untidy people in untidy tenement houses, and the disgusting practice which is said to prevail in them of finishing the cigar "with a lick."

It is asserted that over five hundred syphilitics are or lately were engaged in cigar making in this city; and the fact is notorious that the tenement houses in which cigar making is largely carried on shelter some of the lowest, filthiest, and most commonly tainted classes in the world. The thought of putting into one's mouth an article possibly handled by such people is certainly not a pleasant one. It is on the score of cleanliness, therefore, quite as much as on that of sanitary precaution, that the cigar holder should be used by all who smoke cigars, unless they know positively who made the cigars they smoke, and have confidence in the cleanly conditions of their manufacture.

The case reported in the London *Lancet* by Dr. Mannsell, of Liverpool, is enough to show that the danger of syphilitic infection by cigars is not wholly imaginary, although there is nothing in the report to show that such infection actually occurred. The case was that of a young girl with a syphilitic sore on her lip; and after describing it, Dr. Mannsell says:

"Independent altogether of the further progress of the case, or of the question as to how she became possessed of the sore, the interest of the case (and a melancholy one it is for smokers), centers in the occupation by means of which the girl got her living, for she had been pursuing it for a period of three weeks with this sore on her lip. She was employed in a cigar factory, where her work consisted in rolling the outer leaf around the bulk of the cigar, and when she came to finish off the end which is put into the mouth, the custom was to bite off the superfluous material with the teeth, making the ends to 'stick with a lick.' The girl naively supposed that some poison had got from the tobacco into a small crack of the lip. But how much poison is it possible got from the lip among the tobacco? She estimated the number of cigars got through in one day at twenty dozen."

There might not have been any serious peril in the act, still we doubt if any prudent person would choose to put into his mouth any one of the three or four hundred dozen cigars which this unfortunate girl had licked to a finish while her lip was sore.

The cases mentioned by Dr. L. D. Bulkley, of this city, in his paper on this subject read before the American Dermatological Association, seem to carry the possibility of syphilitic infection through cigars a long way toward positive proof; far enough, at any rate, to make the use of cigar holders not an unwise or unnecessary precaution on the part of cigar smokers. While we know that reputable American cigar makers are careful to prevent the untidy practice which seems to have been followed in the English factory mentioned by Dr. Mannsell, and require their finishers to follow more cleanly methods, there remains the unpleasant fact that tenement house workers are not under supervision, and are not by nature or habit inclined to be fastidious in their own tastes or scrupulous with regard to the tastes of others.

Having no personal knowledge of the comfort to be derived from sucking the end of a roll of tobacco, we are obviously incompetent to advise smokers in this matter; nevertheless we may be allowed to submit the opinion that while the risk of syphilitic taint from infected cigars is extremely small there is still a risk, which the cigar holder is calculated to obviate. If we had to smoke cigars we should prefer to use a holder.

Transit Across the Brooklyn Bridge.

At a recent meeting of the trustees of the Brooklyn Bridge, a resolution was offered providing for the appointment of a committee to consider the question of the means of transportation over the bridge. This enormous and enormously costly structure being nothing more than the greatest railway bridge of its sort in the world, it is time, the editor of the *Sun* properly says, for its managers to begin the discussion of the methods of conveying freight and passengers across it.

We were promised last spring that the bridge should be completed by the next Fourth of July, but there have been delays which may put off its opening several months later. At any rate, the structure is now receiving its finishing touches, and we begin to get some idea of what it will be when it is done. Standing on the elevated railroad station on the east side of Chatham street, near the City Hall, a clear view from tower to tower and over the approaches may at last be obtained.

No one who takes the pains to look at that view can fail to be impressed with the magnitude of the work. It is indeed a stupendous structure as we see it, and yet much of its heaviest and most costly work, that spent on the foundations, is beyond the sight. And all this labor and expense have been laid out on the building of a single railway bridge between New York and Brooklyn; on what in all probability will practically prove to be only a connecting link between the elevated railway systems of the two cities.

The bridge will unquestionably be used by a large share of the people who travel to and from Brooklyn and New York, and for them will prove of great convenience; but it will be only one line of communication. If the wants of the people of Brooklyn were thoroughly satisfied, we should need not one bridge, but several. With but one existing, the ferries will continue to be used by a great proportion of the travelers, and perhaps very generally by the wagons going to and coming from Brooklyn. Loads drawn by horses are likely to cross chiefly by ferryboat as now, and people who live near the ferry landings on the other side and are employed near those in this city, will find it more convenient to use the old method of communication.

But for people living on the outskirts of Brooklyn, or who have occasion to use the rapid transit on the other side of the river, steam locomotion across the bridge will be a great gain. We may expect, therefore, that the opening of the bridge for use will be followed by the extension of the population of Brooklyn and the steady advance of the limits of that city. It will have an effect analogous to that produced on our upper wards by the establishment of rapid transit.

It is probable that large locomotives, traveling at a high rate of speed, will be used to carry over passengers. The project of drawing the cars with cables is not favorably received by engineers, and the superior advantages of employing locomotives are urged. The bridge can sustain them in entire safety, and greater speed will be obtained by their use.

How to Have Ice Next Summer.

A great many people do without ice in the summer—though the ponds and streams at their doors furnish an abundant supply every winter—simply because they imagine that an expensive icehouse is needed to hold the ice. A gentleman who once labored under the same delusion, describes in the *Tribune* the experience by which he was led to store his summer supply of ice successfully, without an icehouse, after paying dearly in disappointment, loss of ice, and loss of money, through having "too much icehouse." He was convinced of his error by the circumstance that the more pains he took with his icehouse the more rapidly his ice melted, while a neighbor who had no icehouse at all always had plenty of ice. The practice of the latter was simply to pile his ice in a square body under a cow-shed having a northern exposure, the first layer of ice being raised above the ground so as to secure good drainage, and the whole covered thickly with sawdust. Boards set on end around the ice pile served to keep the sawdust in place. The gentleman referred to says:

A pile of ice six feet high, eight feet wide, and eight feet long will make three hundred and eighty-four cubic feet. And this is enough for the use of an ordinary family for the table and to cool the cream, etc. Six team loads fill an icehouse which contains about four hundred cubic feet. The blocks should be cut as smooth as possible and square, so they will fit closely, and then ice must be chopped up fine and crowded in between the pieces so as to make a solid mass. The closer the ice is packed, and the more solid the mass is united together, the better it will keep. When an icehouse is too close, there is a great deal of condensation, which makes the whole contents wet and dripping, and causes the ice to melt rapidly. The air must be kept as dry as possible, one secret of keeping ice being plenty of ventilation. The more ice there is in a pile the better it will keep. A small quantity must be covered deeper and thicker than a large mass. A large mass will almost keep itself. It does not require the protection of sawdust, but straw or a double wall of boards will be ample. Every person who makes butter ought to have ice. It will more than pay for use in the dairy, and then for the family it is a luxury every provident man should supply.

Electric Light Wires.

We give below a letter from Mr. James Harrison, of the Board of Fire Underwriters, describing a singular accident occasioned by electricity from an electric light wire. In shifting this wire on the top of a building, it was accidentally brought into contact with a small telephone wire that led into an adjacent building, and the electrical charge inflamed the thread covering of the telephone magnets. This is a species of accident that can readily be prevented by covering the electric light wires or the telephone wires with insulating material, or using a return wire on the electric light circuit.

The rapid extension of both the telephone service and the electric light service in cities will probably put an end to any dangers like the above, as it is found that insulation of the wires is necessary to insure the best results, whether for lights or telephones, and covered wires are therefore taking the place of the uncovered wires.

Mining Operations in Great Britain.

The report of the Inspector General of Mines in Great Britain for 1879 has just been published. The number of persons engaged in mining operations in the United Kingdom was 523,870. The total number of serious accidents amounted to 843, and the number of deaths resulting, 1,037, a diminution as compared with 1878 of 39 in the number of accidents and 453 in the number of deaths. There was an average of one accident for every 621 persons employed, and a death for every 505 persons.

In the twelve districts under the Regulation Act of 1872, for the coal mines 476,810 persons were employed in or about the mines, of whom 385,179 were below the surface, and 91,631 above; of those above, 4,842 were women.

The products of the mines for the year were: 133,720,393 tons of coal; 9,387,766 tons of iron ore; 1,455,003 tons of potter's clay; and 803,207 tons of mica. The amount of coal produced was 1,108,330 tons more than in 1878, while the other items were less by the following amounts: iron ore, 1,359,461 tons; potter's clay, 170,583 tons; and mica, 10,055 tons.

Fire Caused by an Electric Light Wire.

To the Editor of the Scientific American:

I venture to call your attention to an occurrence which took place at No. 4 Maiden Lane very recently. In the office of Messrs. Silcox & Co., No. 4 Maiden Lane, is a telephone communicating with their factory, No. 14 Maiden Lane. One day, either Monday or Tuesday last, some person on the roof of one of the intervening buildings dropped an *electric light* wire upon that of the *telephone* wire of Messrs. Silcox, bringing the two wires in contact. The effect rather astonished the people in the office. Flames burst forth from the telephone instrument on the wall, producing such an intense heat as to entirely destroy the magnets. Can you, through your valuable journal, give us a possible reason for this?

Suppose the same thing should occur at Ridley's, or Lord & Taylor's, or any other establishment having telephones. In most of these establishments there is a large amount of open stock lying and hanging in every direction. It occurs to *us* that if there is a danger of similar accidents in these stores, it will be apt to throw the *show window* fire traps into the shade.

JAS. HARRISON,
Superintendent Bureau of Surveys, New York Board of Fire Underwriters.
No. 115 Broadway, New York, October 21, 1880.

The Universal Grinder.

Messrs. Newell & Chapin have on exhibition at the Fair of the American Institute, their patent universal grinder. The grinder consists of hard iron or steel disks with beveled edges, locked together upon a shaft composing a cylinder with a series of angular grooves. Upon the sides of the disk are radial cutters or teeth. Another shaft with similar disks is so placed that the disks of one cylinder fit into the spaces between disks on the other. This machine will grind phosphates, barytes, lead plumbago, gold ore, quartz, plaster, shells, bone, wheat, corn, and other materials required by the manufacturer or farmer. The manufacturers exhibit an interesting collection of minerals and cereals ground by these mills, which shows that they are adapted to a wide range of uses.

POLICE TELEPHONES.

Chicago leads the way in adopting telephones for general police uses. Experimental telephonic stations have been established at various points in one important district, and relays of mounted officers are kept in waiting at a central station. Reliable citizens are furnished with keys to the telephone boxes nearest their residence. To prevent false alarms the keys are numbered, and cannot be withdrawn from the lock until released by a key carried by the police man on that beat. When anything goes wrong in a district, the alarm is sent to the central station, and explanations are given through the telephone. In case of serious disturbance a large bell is sounded, and every officer on post runs to the nearest box to receive orders.

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Fig. 5.

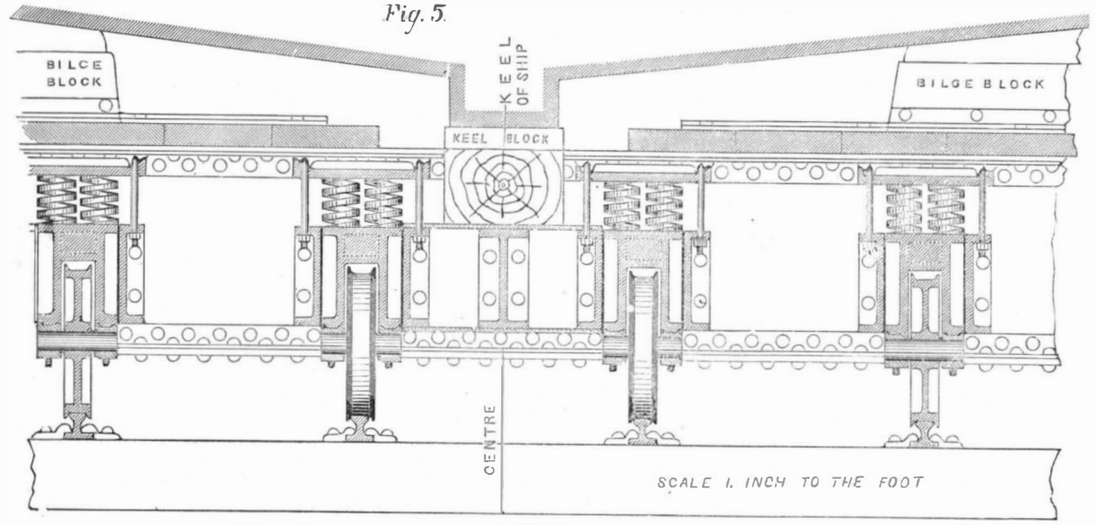


Fig. 8.

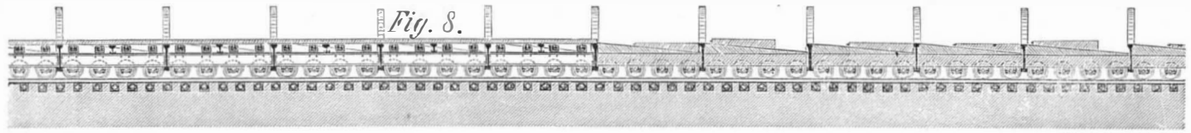


Fig. 6.

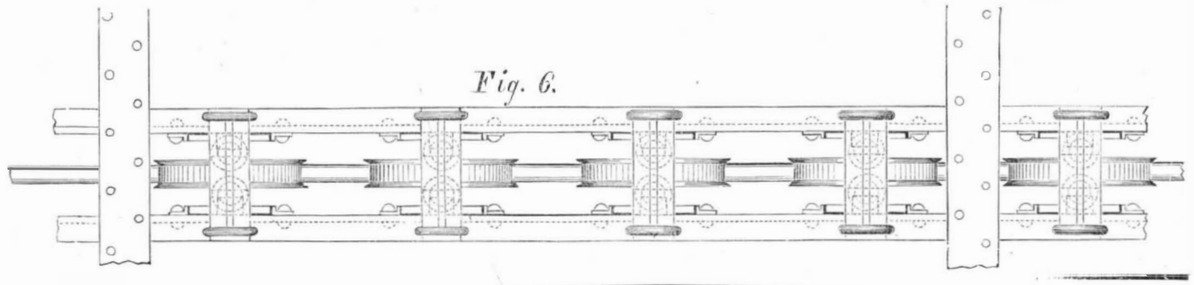


Fig. 7.

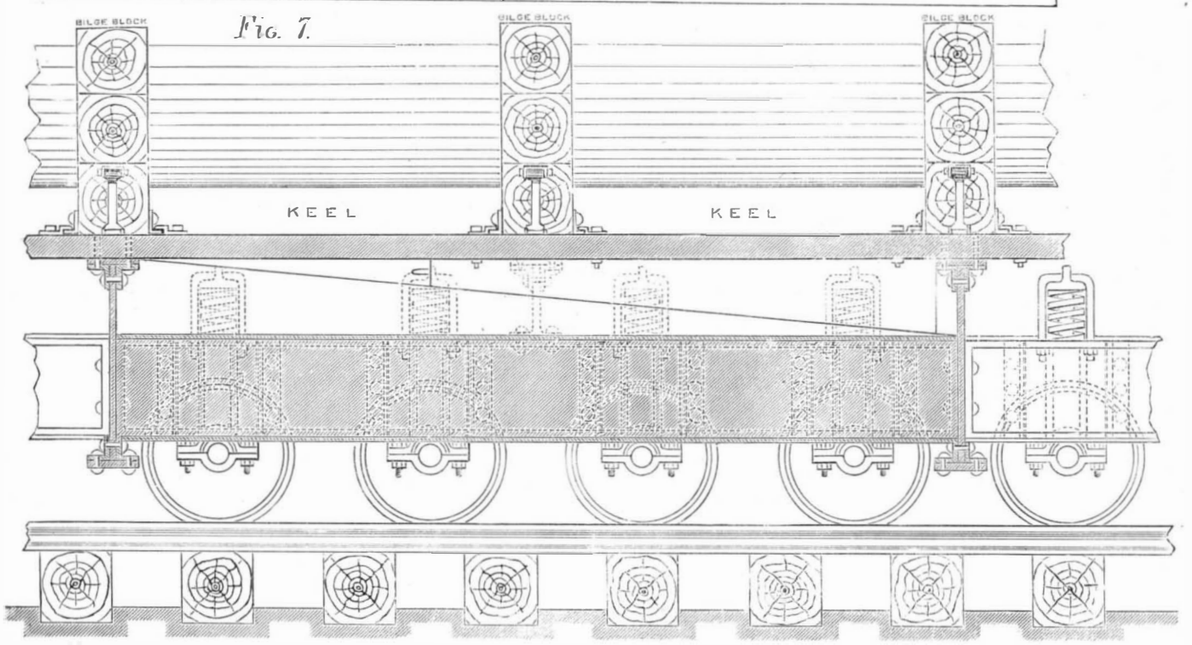


Fig. 3.

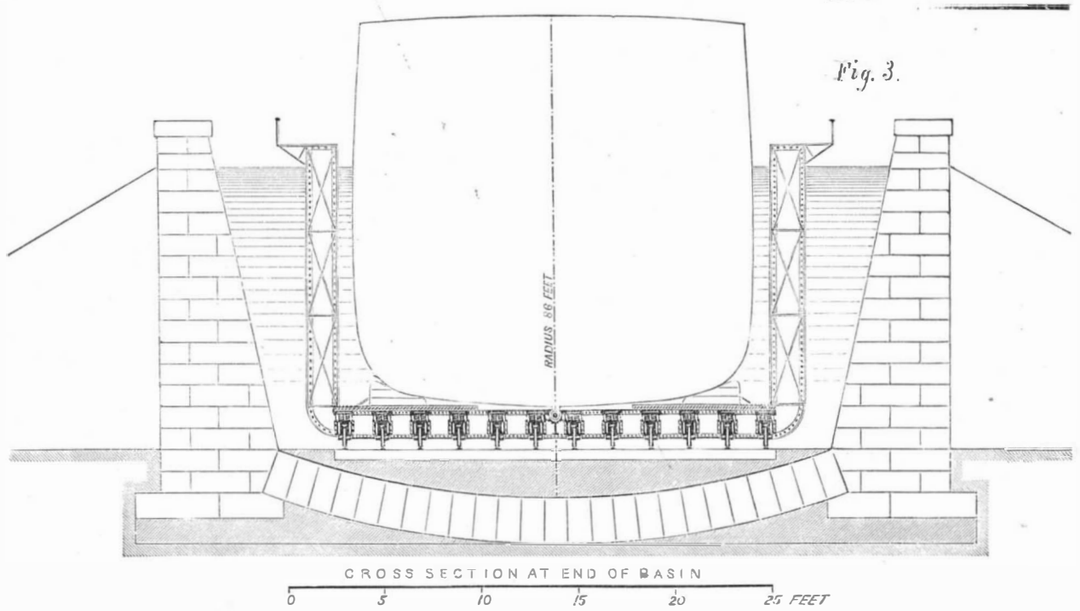


Fig. 2.

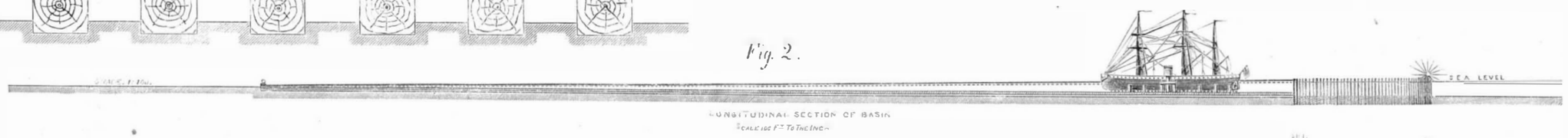
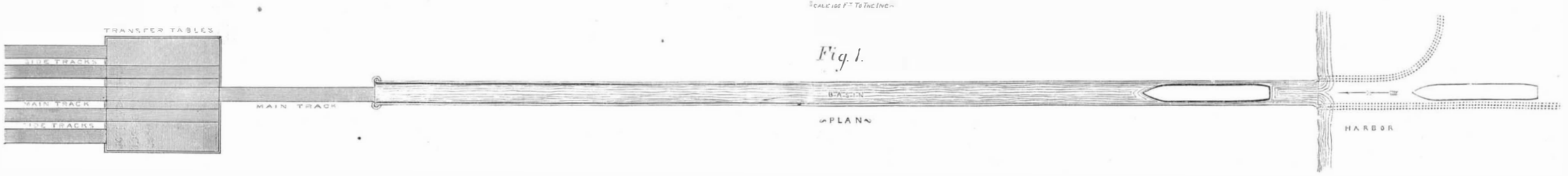


Fig. 1.



MR. EADS' GREAT SHIP RAILWAY FOR THE AMERICAN ISTHMUS—DETAILS OF CONSTRUCTION.—[See page 308.]

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The Cause of the Seawanhaka Disaster.

An important clew to the cause of the disastrous fire on the steamer Seawanhaka, last June, has been disclosed in the breaking up of the metallic skeleton of the wreck. What was left of the steamer, as it lay on the sunken meadow off Randall's Island, East River, was purchased by Mr. Matthew H. Gregory, of Red Bank, N. J., who is now engaged in recovering the iron and copper. In pursuance of this work the shell of the starboard boiler has been stripped off, disclosing the fact that the outermost of the eight large circular flues of the boiler had burst at the point where it joined the back flue sheet. A *Herald* reporter, who had visited the wreck in company with Mr. Gregory, says that the quality of the iron of that part of the boiler was evidently very poor.

"Originally the iron of the flue was three-sixteenths of an inch thick, but in some places near the break it is not now more than one-sixteenth of an inch. The break gave every indication of an explosion. The force which broke it was evidently from the inside of the flue, since the jagged edges turn outward. A few inches from the place of the break the flue has at some time been patched, a fact which has not been developed by the official examinations. The patch is riveted to the flue, and covers a space of about half a foot. Until some better reason is put forward the presence of that patch will be taken as an argument for the weakness of the iron.

"The hole above described was not more than eight inches from the patch, and the wearing out process must have been going on for a considerable time. Mr. Gregory could not say how much the break had to do with the accident, but an expert could easily determine. If the break occurred before the fire, it certainly is large enough to have admitted the water and caused a back draught. That a back draught created the fire is the opinion of four-fifths of the experts who have testified since the catastrophe."

A New Military Telegraph Line.

The signal service has just completed a telegraph line across the northwestern territories from Bismarck, Dakota, to Dayton, Washington Territory, crossing the Rocky Mountains by the Sohon Pass. For the transaction of commercial business it has offices open at the following points: Bismarck, Rapid City, and Deadwood, Dakota; Bozeman, Helena, and Deer Lodge, Montana; Spokane Falls, Colfax, Almota, Pomeroy, and Dayton, Washington; and Lewiston, Idaho.

Chicago Manufactures.

Few people have any idea of the rapidity with which Chicago is becoming a great manufacturing center. The statistics gathered by the Secretary of the Board of Trade for the forthcoming census report show 3,752 manufactories in the city, giving employment to 113,507 operatives, and representing a capital of over $80,000,000. The value of the output annually is $249,000,000; value of material used $178,000,000; wages paid, $37.000,000.

NEW NURSING BOTTLE.

The body of the bottle shown in the annexed engraving is made in two parts, one fitting into the other at their junction, the external one being provided with an internal flange for receiving the packing ring, against which the edge of the inserted part rests. Upon one part of the bottle is formed a bead which runs around it spirally, forming a screw thread which is engaged by a metallic ring fitted over an external flange formed on the other part and capable of drawing the two parts firmly together against the packing ring.

The stopper through which the tube passes is inserted from the inside of the bottle and cannot therefore be drawn out accidentally. The nipple, as will be seen by reference to the small sectional view, is held in place by the shield which is slipped over the portion of the nipple bulged out by the bead formed around the end of the neck of the tube. This forms a very secure fastening for the nipple.

The body of the bottle has an inwardly projecting ridge which insures the greatest possible depth of milk for the inner end of the tube.

This bottle may be readily taken apart for cleaning, and avoids the imperfections found in other bottles.

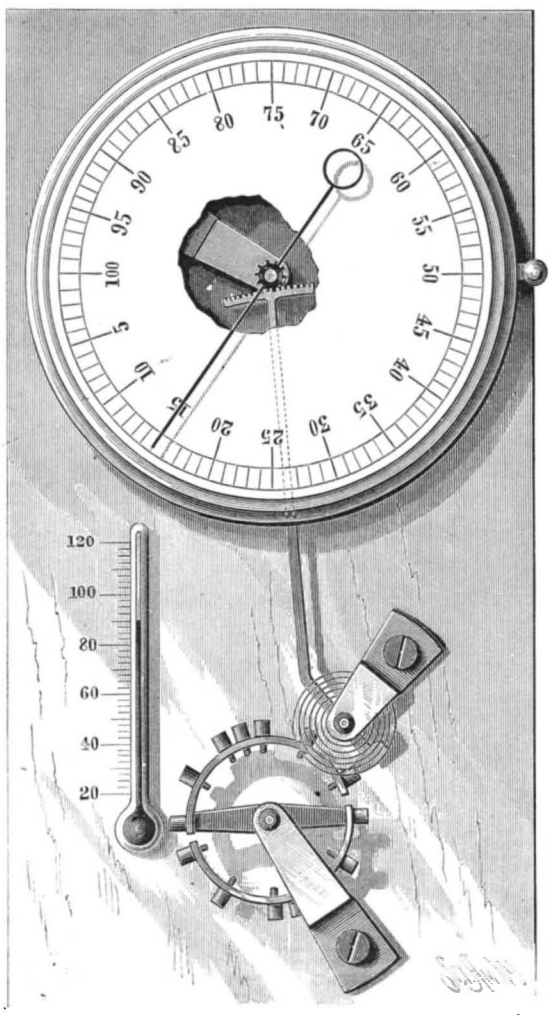
For further information address the inventor and patentee, Mr. E. A. Barton, 348 Notre Dame street, Montreal, Canada.

Plan for Catching the Express Trains.

M. Hanrez, of Paris, is the author of a method of taking up carriages by a train *en route*, in order to avoid stopping trains at stations to take passengers up. A "waiting carriage," fitted with a steam engine with special gear and space for passengers and luggage, is placed on a siding at the station, and picked up by the train as it goes past. The latter, by means of a hook on its last carriage, catches a ring supported on a post, and connected with a cable wound on a drum in the waiting carriage. Thereupon the drum begins to unwind, and in doing so compresses a system of springs, while the carriage is moved at a rate gradually increasing to that of the train. The engine of the carriage then winds in the cable, the train and carriage are connected, passengers are transferred from the joined carriage to the train, and *vice versa*, then the two are disconnected, and the engine of the carriage working on the wheels brings it back to the station whence it was taken.

APPARATUS FOR ADJUSTING BALANCE WHEELS OF WATCHES.

The engraving shows a device for indicating any alteration



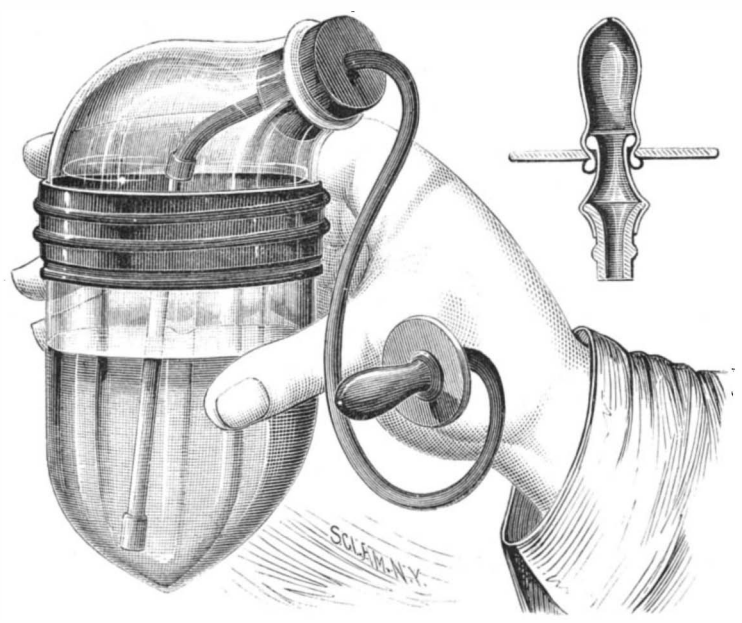
IDE'S APPARATUS FOR ADJUSTING BALANCE WHEELS OF WATCHES.

in the form of the balance wheels of watches, chronometers, and other horological instruments by changes of temperature. The invention consists of a holder for the balance wheel, a multiplying lever, and an index actuated by the lever. The short arm of the lever touches the periphery of the balance wheel, and the longer end carries a curved rack which engages a pinion on the arbor of the index.

By means of this mechanism the slightest change in the form of the balance wheel is indicated by a movement of the index. A thermometer is mounted on the instrument, so that its indications may be readily compared with those of the index.

The inventor proposes to make the instrument double, so as to test both sides of the balance wheel simultaneously.

This invention was recently patented by Mr. F. F. Ide, of Springfield, Ill.



IMPROVED NURSING BOTTLE.

SOME one has said, what thousands have observed, that there is nothing keeps longer than a middling fortune, and nothing melts away sooner than a great one. Poverty treads upon the heels of great and unexpected riches.

The American Apple Crop.

It is gratifying to be able to record that, notwithstanding the failure of the crop of apples in this country, we are to have abundant supplies from America. Accounts from Boston report the crops to be the largest for many years, perhaps to the extent of 40 or 50 per cent. Up to June 30, 1880, the shipments from Boston to England amounted to 173,379 barrels, of a money value equal to over £70,000. It is expected that with the heavy crop this season the exports for the current year will nearly double those figures. Already large supplies are coming to hand from New York, the Anchor Line steamers arriving at Glasgow last week having over 5,000 barrels, which were sold at moderate prices for the early time of the year. The fruit, as a rule, is of excellent quality, and when it arrives in good sound condition will keep for a considerable time.

Many grocers consider it advantageous to add green fruit to their general stock, and the public begin to find out that they can purchase from the grocer at a cheaper rate than from the fruit merchant. In these times when the grocer is beset on every side by opposition from "stores" and "wholesale retailers," etc., it behooves them to look around for fresh articles for sale whereby they may recoup their loss. To those who have not already done so we would say: Add the green fruit business to your trade, and we are of opinion that you will not have any cause to regret it, provided the business be conducted with care and discrimination, and only such articles purchased as are found to be in demand in their respective localities.—*London Grocer.*

Fast Horses.

The standard trotter is one that can cover a mile in 2:30. It is said that less than 600 of all the horses raised and trained in the United States have this record. The number that can trot in 2:50 bear the ratio of 1 to 2,383 horses raised. As a business the breeding of fast horses is therefore very much of a lottery; and when we recall the fact that the high prices which famous colts have brought have rarely been received by the men who raised them, the prizes in breeding and training trotters are few and uncertain.

MECHANICAL INVENTIONS.

Mr. Eugene H. Angamar, of New Orleans, La., has patented a simple and effective apparatus for freeing railroad tracks from snow and ice by heat, more especially street railroads; and the invention consists in a truck fitted for running on the track and supported on hollow wheels, which are fitted with grates for burning fuel, and perforated so that the wheels may be highly heated.

Mr. Hilliard B. Smith, of Stephenville, Texas, has patented an improvement in wind wheels which consists in a novel arrangement and combination of wings or gates in a casing outside and independent of the wheel, whereby provision is made for adjusting the position of the wings, and consequently regulating the speed of the wheel, according to the force of the wind.

An improvement in rotary blowers has been patented by Mr. Charles A. Smith, of Philadelphia, Pa. This invention consists in certain novel details of construction and arrangement of parts which cannot be readily described without an engraving.

Messrs. Conrad Eimbeck and Fritz Wehrmann, of New Haven, Mo., have patented an improved coupling for connecting the forward axles and the bodies of buggies, buckboard wagons, and other vehicles, so constructed as to give the axle a free vertical and horizontal play, and thus better adapt the vehicles for use upon rough, uneven, and sideling roads.

An improved machine for framing timber has been patented by Mr. Richard H. Watson, of Leadville, Col. This machine is intended to accomplish by power the work of framing timber used in mines, shafts, tunnels, and similar underground works. The inventor makes use of a suspended carriage or frame fitted for movement in vertical guides and carrying two horizontal saw arbors fitted at right angles. This is combined with a bed carrying adjustable head and tail blocks for holding the timber and presenting it properly to the saws. A winding drum and friction pulleys feed the saws, and devices of novel character center and clamp the timber.

An improvement in that class of windmills in which the wheel is inclosed in a cowl, has been patented by Mr. Albert S. Dimock, of Hutchinson, Kan.

An improved lifting jack has been patented by Mr. John Paar, of New York city. The object of this invention is to construct a jack that can be made to press both upward and downward at the same time, or to operate either upward or downward, as may be desired.

Wintering Flower Roots.

The roots of many useful and ornamental plants, such as cannas, dahlias, and gladiolus, may be safely wintered in dry soil by means of external coverings. But as they do not require light during the winter it is safer to lift and store them in a dry cellar or building from which frost is excluded. We find them to keep best, says an agricultural writer, packed in a soil just moist enough to keep the roots from swelling.

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Artisan and Artist.

A critical writer in an English magazine (the *Cornhill*) finds a potent cause for the separation between artistic and industrial work in the rapid growth of the manufacturing system in Northern Europe.

"During the Middle Ages the painter, the sculptor, and the wood-carver were all higher handicraftsmen whose handicraft merged insensibly into that of the decorator, the joiner, the jeweler, and the potter. These lower trades still gave an opportunity for the display of individual taste, of artistic fancy, of that capricious quaintness which forms, perhaps, the greatest charm of mediæval workmanship. But with the employment of machinery the separation became broad and pronounced. Steam-woven patterns and calico prints have superseded the hand-made embroidery and rich brocades of earlier times. Cheap moulded crockery and stamped designs have taken the place of jars turned upon the wheel and painted decorations. Wall papers hang where tapestry hung before, and chintzes cover the chairs that were once covered by delicate needle work. Electroplate teapots, machine-made jewelry, and ungainly porcelain vases replace the handicraft of humbler Cellinis, unknown Ghibertis, or inglorious Palissies. Under the influence of this cause, industrialism became frankly cheap and ugly, while æstheticism retreated into the lofty upper region of the three recognized fine arts.

"In proportion as the industrial system was more or less developed in each European country did the divorce become absolute. In Italy and the south, where the manufacturing spirit never gained a firm footing, individual workmanship survived and still survives. Florentine mosaics, Roman cameos, Genoese filigree work, Venetian glass, are all of them relics of the old artistic handicraft which has lived on unmoved among the quiet Italian towns. In France, more manufacturing than Italy, but less so (at least during the eighteenth century) than England, we find a sort of intermediate stage in Sèvres porcelain and Gobelins tapestry, in Louis Quinze marquetry and Dieppe ivory-carving. But in England the gap was truly a great gulf. Between the Royal Academy and the Birmingham or Manchester workshops there was no common term. Most of English manufactures were simply and unpretentiously utilitarian. They had no affectation of beauty in any way. Whatever art furniture existed in the country—mosaic tables or buhl cabinets in a few noble houses—was brought from those southern lands where industrialism had not yet killed out the native art faculties of the people. A piece or two of Chinese porcelain, a stray bit of Indian carving, an Oriental rug or embroidered cushion here and there carried the mind away to Eastern countries where steam and factories were yet wholly unknown. But in England the stereotyped uniformity of manufacturing ugliness bore undivided sway, and if a solitary Wedgwood at rare intervals had originality enough to set up some attempt at artistic industrial work his aspirations naturally cast themselves in the prevailing classical mould. From these tendencies two evil results inevitably flowed. In the first place, art came to be looked upon by the mass, even of the middle classes, as something wholly apart from everyday life. The æsthetic faculty was a sense to be gratified by an annual visit to the Academy, an occasional perambulation of the National Gallery, and perhaps a single pilgrimage during a lifetime to Rome and Florence. For the lower classes art ceased to exist at all. Their few sticks of furniture, their bits of glass and crockery were all turned out on the strictly manufacturing pattern, with the least possible expenditure of time and money. Only the extreme upper class, the landed aristocracy and very wealthy merchants, could afford to live in an atmosphere of pictures and statues, of Italian art furniture and Oriental porcelain."

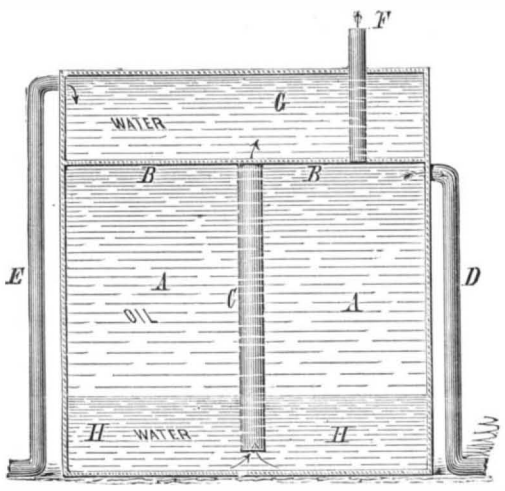
The only fault to be found with our critic's statement of the case lies, we take it, in the assumption that "industrialism" is essentially and of necessity unartistic. It would be nearer the truth to say that when manufacturing began in the north of Europe the working people were grievously deficient in artistic taste, and so were the multitude who furnished a market for the manufacturer's wares. They had no "native art faculties" for manufacture to destroy. It was with them a step upward—from nothing to something—even though that something was cheap and ugly. The pottery and other wares turned out by English manufactories were not beautiful at first, not so much because of the necessary limitations of the scope of power machinery and large production, as because of the general lack of taste on the part of the makers and users of the wares. With the social and intellectual elevation of the masses the level of popular taste has risen, and our large factories have steadily improved the artistic character of their work to meet the rising demand. Meantime, while our artisans have been developing as artists, marrying beauty with utility, it has become the cant of the picture makers and their followers—artists *par excellence* in their own estimation—to associate æsthetics solely with inutility, and to deny the artisan's right to consider himself an artist, except when he makes or imitates something that the world has no longer any use for.

There is no portion of the community more pitifully destitute of genuine art sense than those who declaim most loudly about the necessary ugliness of modern manufactured products, and simper over the "exquisite loveliness" of such bits of ancient or oriental stuff as it is the current fashion to call artistic. Next year the same things and styles may be out of fashion. Those who rave over them now will then pronounce them vulgar and ugly, and torture their æsthetic sensibilities over some other antique novelty; all the time fondly imagining that the soul of art dwells exclusively with them. It never occurs to them that their followers a hundred years hence will rave in the same way over the works of the artistic artisans of to-day.

LIGHTNING-PROOF OIL TANK.

The enormous losses that have been incurred of late years from tank fires, the danger which threatens from the ignition of stored oil to whole towns and cities, have excited the attention not only of oil men, but scientists at large to the means of securing effectual protection. It is evident that the methods of storage ordinarily adopted have proved ineffectual; the precautions taken against lightning, or from conflagration of the contents of tanks from others that have caught fire, have proved worthless. The means of securing immunity from lightning have been studied philosophically and scientifically by Col. E. A. L. Roberts, of Titusville, Pa., and by the aid of a diagram we will explain it for the benefit of our many readers connected with the oil business. The principle on which it is based is that oil will not catch fire until vaporized, in other words, until it is blended with a certain proportion of the oxygen of the atmosphere. A ton of glycerine has been exploded in oil wells in Pennsylvania without setting them on fire, simply because the oil was under conditions that did not allow of the immediate blending with it of air or oxygen. Exclude these agencies and one might as well attempt to set fire to water.

Col. Roberts accordingly conceived the idea of so constructing tanks that they would not allow of evaporation; in other words, tanks with which no air could come in contact. His tanks, constructed as follows, completely compass this purpose: A A, space in tank for oil; B B, diaphragm; C, balance pipe; D, filling and drawing-off pipe for oil; E,



OIL TANK PROTECTOR.

overflow and inlet water pipe; F, vent pipe; G, water reserved on top of diaphragm; H, water in bottom of tank.

It is easy to show by reference to this diagram that there can be no possible liability to conflagration. Instead of the roofs now used the surface of the tank would be covered with a diaphragm. This diaphragm is of iron, and is so placed as to leave a space of a few feet between it and the top line of rivets. An eight inch pipe termed the balance pipe passes from this diaphragm down the middle of the tank to within eight inches of the bottom. The tank is filled with water by means of the pipe, D, which enters the tank immediately under the diaphragm. As the water fills up, it ascends the balance pipe, forcing the air completely out of the tank through the vent pipe, F, and the pumping is continued till it reaches up to the rim of the tank. The process of filling the tank with oil now commences by means of the pipe, D, which is also the filling and drawing off pipe for oil. Thus the oil is pumped through the same pipe through which the water has been forced. As the oil settles upon the top of the water, immediately under the diaphragm, the force which the pump gives to the oil then presses the water, as the heaviest substance, downward, and it passes up the balance pipe into the space marked G, the surplus passing away through the overflow pipe to the left of the tank in the above diagram, and marked E. On the space reserved for oil being entirely filled from under the diaphragm to the lower end of the pipe there remains about six inches of water, while the diaphragm and the sides of the tank being air-tight, no air whatever can mingle with the oil, which will also be protected above by its overlay of water above the diaphragm. Thus situated the oil may be said to be hermetically sealed when the top cock at the head of the vent pipe is turned off. It is obvious that in running the oil out no air can get access to the interior. To force it out by the pipe, D, water is pumped in by the overflow pipe, E, the water exerting the necessary pressure. In running down the balance pipe from the reserve tank above the diaphragm the water fills the exact place of the discharged oil.

Instruction in Industrial Art.

THE American Carriage Builders' Association, in convention at Chicago, October 21, adopted a resolution for the establishment of a school of technology in this city, especially devoted to the art of carriage building.

The trustees of the New York Metropolitan Museum of Art had expressed a willingness to add a branch to the museum devoted to art instruction and original designing, in connection with carriage building, if a fund of $1,000 a year for three years were guaranteed. More than this sum was promptly subscribed. The aim of the trustees of the museum is, we believe, to establish industrial art schools for the benefit of American artisans in all the trades.

MR. EADS' SHIP RAILWAY FOR THE AMERICAN ISTHMUS.

For many years the popular idea has been that whenever the genius and energy of man should overcome the barrier to commerce which nature has placed at the American Isthmus, it would have to be accomplished by a ship canal. For many years exploring parties, supported by private munificence or by government appropriations, have been searching for the most favorable lines for transisthmian commercial routes, always contemplating the ultimate construction of a ship canal. And so persistently have the advantages and disadvantages of the different canal routes been insisted upon by their respective admirers and opponents, that there are few engineers of high rank, who have considered the question at all, who have not pronounced in favor of one or other of the several canal routes that have been surveyed.

Accordingly, when a new man enters the field with a novel plan, confidently offering to make a dry way for the world's commerce over the Cordilleras, in a quarter of the time and at a quarter of the cost of a ship canal such as Mons. De Lesseps proposes, the natural inquiry is, "Who is he? and what has he done to justify so bold a traversing of the opinions of the world's best known engineers?"

The world's best engineers do not need to have that question answered for them, though the general public may. The engineering world have already admitted Mr. Eads to an honorable place in the front rank of scientific and practical engineers. They know him as a man quite as remarkable for the soundness of his views, in great engineering emergencies, as for the boldness and originality of them. They know him, too, as a man whose professional career has been marked by grand successes as well as grand undertakings—successes achieved in more than one instance by methods as original as they were scientific and simple, accomplishing results of unequaled magnitude with the least delay and the greatest economy.

When the exigencies of civil war called for the immediate and speedy creation of a new order of war vessels, suitable for river navigation, yet capable of successfully assailing land batteries protected by earthworks, it fell to Mr. Eads to supply the need; and his fleet of "improvised ironclads" played a vital part in opening the Tennessee and the Mississippi.

When the requirements of peaceful commerce demanded an iron way across the Mississippi at St. Louis, a bridge which should offer no impediment to the commerce of that broad river, the same bold and practical spirit not only planned the structure, but saw it built, a work requiring the highest engineering and financial capacity, for the problems presented were in many respects not only novel in character, but involved operations of a magnitude never before undertaken.

Still more recently, when the general commerce of the great artery of the continent required a freer outlet below New Orleans, and when the government engineers were committed to a costly canal, Mr. Eads came forward with a solution of the problem directly contrary in its principles to that which had been proposed, and vastly less expensive in time and money. Still more, he was willing to stake his private fortune on the event, confidently undertaking to open the Mississippi in his own way at his own risk, asking no pay for his work until his scientific and official opponents should certify that the task had been successfully accomplished. Our readers do not need to be reminded of the magnitude of the work undertaken at the mouth of the Mississippi, the severity of the engineering problems it involved, the vast economy of the jetty system, or the marvelous celerity and certainty with which it overcame the barriers which nature had placed at the outlet of the great river.

In place of a doubtful channel admitting only vessels of less than eight feet draught, the Mississippi now offers a broad free entrance to the largest ocean steamers; and to emphasize the fact, which the commercial world is slow to realize, the merchants of New Orleans are arranging for a visit to their wharves by the Great Eastern.

These great achievements are referred to here simply as evidence that Mr. Eads is not a novice in engineering and finance, nor a speculative adventurer, but a scientific and notably practical man, whose large and varied experience in the planning and conduct of great enterprises gives pertinence and weight to any proposition which he may lay before the world. Whatever problems of engineering, mechanics, or finance may be involved in the planning and construction of a ship-canal or a ship-railway across the Isthmus, and no one will question their multiplicity and magnitude, they have already been met and successfully overcome by him elsewhere, on a scale not out of comparison with those of the new undertaking. In laying before the world a plan of a ship railway, like that which we illustrate on our first and fourth pages, Mr. Eads offers no speculative project, but the well-considered design for a capable and experienced engineer, a working plan which can be carried out with absolute certainty.

At first thought most persons unfamiliar with the resources and practices of modern engineering are apt to look with incredulity, if not with amazement, upon a project

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contemplating the hauling of great ships over land from one sea to another.

A ship, they say, is a structure made to float in the water, buoyed up by a mobile substance, the nature of which not only prevents unequal strains upon the ship from her general weight, but also helps her to resist the internal or bursting strain of her own cargo. Out of her proper element, they argue, all these conditions are reversed. The uniform support of the water is replaced by detached supports, subjecting the vessel to unequal and unpremeditated strains which she cannot safely endure. Accordingly, even if it were feasible to build a carriage strong enough to sustain a ship's huge bulk, or a roadbed firm enough to bear the weight of both ship and carriage, the proposed system of Isthmus transit must be a failure through the lack of adaptability of ships for that sort of handling.

In answer to these apprehensions it is enough to say that they are founded in a view of the case which every ship builder knows to be altogether inconsistent with fact. A ship afloat is not uniformly buoyed up by the water. On the contrary, especially where there are waves of any magnitude, a ship's support is not only unequal, but incessantly variable as to position. This fact is so well recognized by shipbuilders that every sea-going vessel is so built as to be able to bear her entire weight when supported only at the ends, or to withstand the strain of being held up wholly at the middle, with both ends unsupported in the air. If a ship is unable to endure these severe tests she is unfit to battle with the waves. As for the bursting strain of a cargo, with or without a counter pressure of water outside, every ship at sea has to withstand it, more or less completely, with the passage of every large wave; while at the same time she is buffeted with heavy seas, which strike with blows like those of a battering ram. Indeed it would hardly be possible to devise an apparatus capable of subjecting a ship to so frequent and severe horizontal, lateral, and tortional strains as a ship endures in every gale. In comparison with them the strains that would be put upon a ship in transit over a properly constructed railway would be as nothing. On the railway carriage the ship would rest on an even keel, uniformly supported from stem to stern, and as secure from lateral and twisting strains as when cradled in a dry dock; while the forward motion of transit over easy grades would be less trying even than that which ships are constantly subjected to in well-known marine railways connected with ship-yards.

In fact the ship railway proposed by Mr. Eads consists of nothing more novel than two marine railways of superior construction joined by a few miles of many-railed roadbed of easy grades. Every element of the system, as well as the ability of ships to endure out-of-water handling safely, has been practically familiar to engineers for half a century. The grades of the proposed railway, it will be remembered, need nowhere be steep, and the change at the summit is made by a tipping table, which prevents any lengthwise strain upon the vessel. At no other point of the road can such a strain occur except by the yielding of the road bed; a contingency which practical engineering is easily able to avoid.

If further assurance of the ability of ships to safely endure out-of-water handling were required, it might readily be found in the every-day handling of loaded canal boats at portages. In staunchness a sea-going vessel compares with a canal boat about as a well-made beef barrel does with a cracker box; and the capacity of canal boats to endure railway carriage was amply demonstrated forty years ago on the Portage Railroad of the Allegheny Mountains. To connect the canal systems of Eastern and Western Pennsylvania, a system of gravity railways with ten inclined planes was constructed between Hollidaysburg and Johnstown, thirty miles or more apart "as a bird flies"; and up and down these steep inclines the large boats of the "Pioneer Packet Line" made regular trips until the Pennsylvania Railroad was built.

In length of route and severity of grades, the Isthmus routes certainly offer nothing worse than was overcome on that Portage road; and it is absurd to say that modern engineering cannot do for ships what was then done for canal boats. Besides we have the direct evidence of some of the most experienced ship builders—among them the Hon. E. J. Reed, formerly Chief Constructor of the British Navy—to the effect that the transport of ships by rail is not only feasible, but that the plan is highly economical in comparison with a ship canal.

The essential features of his projected railway for transporting ships across the Isthmus were described and discussed by Mr. Eads before the Canal Committee of the House of Representatives last March. So many of the illustrative plans and drawings used by Mr. Eads on that occasion as are necessary for a clear understanding of his plan are reproduced in the engravings herewith. The large illustration on our front page gives a general view of one of the shore ends of the proposed road, with a large man-of-war just entering upon the transisthmian journey.

Fig. 1, at the bottom of the front page, shows a section of the basin, which constitutes the real terminus of the railway. To avoid extending the track out into the harbor, this narrow basin, 3,000 feet long, is excavated inland at right angles to the shore line of the harbor. At the harbor end the basin is deep enough to place the railway thirty feet below the surface level of the water. From that point the track rises one foot in the hundred, so as to reach the surface level at the shore end of the basin. This basin, and the corresponding one at the other end of the railway, will be lined with substantial masonry. The outer end will be provided with a caisson gate, or lock gates, so that the basin can be pumped dry for repairing the track under water. At all other times the gates will be open.

Fig. 2 shows the basin railway with a ship on the cradle. In transferring a ship from the harbor to the upland track the cradle or ship-car will have to be backed down to the harbor end of the basin, under water, by means of a stationary engine. The ship will then be floated in from the harbor, so that her keel will rest over the cradle. Then the various supports on which the keel and bilges will rest will be moved into place.

Fig. 3 shows, in cross section, a ship resting on the cradle in deep water, and illustrates the manner of supporting her, substantially as is done in every dry-dock. Her weight rests mainly on the keel, a portion being sustained by the opposing bilge blocks, which also serve to keep her from toppling over. A similar cross section near the shore end of the basin is shown in Fig. 4. In the latter cut the vessel has been drawn nearly out of water. When entirely out the stationary engine will be detached and two powerful locomotives will be hitched on to haul the massive load to the opposite sea. It is expected that the transit will be made at the rate of ten or twelve miles an hour, and an additional hour will be consumed in placing the ship in cradle and in discharging her at the overland journey's end.

As will be seen in the engravings, the railway will be composed of twelve rails, spaced four or five feet apart. The locomotives will be five times as large and powerful as ordinary freight engines, and the whole twelve rails will be used by the two locomotives and their tenders. The ship cradles are intended to be of suitable lengths to receive all classes of vessels, and will have wheels about three feet apart on each rail, making a total for large steamers of from ten to twelve hundred wheels.

The maximum pressure allowed to a wheel capable of sustaining twenty tons will be five tons, or considerably less than the ordinary pressure upon the driving wheels of a large locomotive, which is usually six and a half tons. The weight of the largest merchant ships fully laden is about 6,000 tons. This weight distributed over 1,200 wheels—one hundred on each rail—will make the pressure on the rails and road-bed quite moderate: The proportion of the strength of one wheel to the strength of the whole number of wheels is so insignificant that the failure of any wheel could have no serious effect on the rest. Each wheel will be independent of the rest and readily removable. The possibility of derailment, as well as the pressure upon the tracks, is obviously diminished by the number of rails. Indeed, any six rails could carry the whole weight, so that any probable breakage or displacement of rails would not endanger the stability of the load upon the cradle.

As will be seen in the detail drawings, 5, 6, and 7, two strong steel springs surmount each wheel, so that the ship will in reality rest upon an elastic cushion, which still further lessens the liability to strain. Each spring is so fixed that it can be removed by unfastening two bolts, and the wheel under it can then be taken off with ease. Another advantage of the multiplicity of rails and wheels is the great reduction of the liability to jolting or oscillation. When a speed of twelve miles an hour is maintained on a railway so constructed the ship's motion would scarcely betray itself. To derail a car carrying a ship in this way would be an utter impossibility. To provide for the passage of ships going in opposite directions on the single line of track, there would have to be stationed at different points transfer or turn tables for moving cars sideways. By such means it is now common to shift trains of cars from one track to another.

The easiest grades for a ship railway across the Isthmus are found at Panama, Nicaragua, and Tehuantepec, and a mean grade, not exceeding thirty or forty feet to the mile, can probably be found at each place. The cheapest line could be built at Panama, where the distance as well as the grade is least. The harbor improvements there, however, would involve a great deal of cost. These would be less at Tehuantepec, and much less in the Chiriqui route, which presents steeper grades, but offers superb natural harbors. The maximum cost of a road at Panama, including harbors, is estimated by Capt. Eads at $50,000,000.

Touching the relative economy of a ship railway compared with a ship canal, Mr. Eads is confident:

"That upon any route where it is possible to build a canal, it is equally possible to build and equip a substantial and durable ship railway for one-half the cost of a canal, if it be built with locks; and for one-quarter of its cost, if it be at tide level.

"That such a ship railway can be built in one-third or in one-quarter of the time needed for the construction of the canal.

"That when built, ships of maximum tonnage can be moved with safety at four or five times greater speed on the railway than in the canal.

"That a greater number of vessels per day can be transported on the railway than would be possible through the canal.

"That the capacity of the ship railway can be easily increased to meet the demands of commerce, without interruption to its business, whether it be to meet an increase in the size of the ships or in the number of them.

"That the cost of maintenance of the roadway and rolling stock will be much less than that of the maintenance of the canal.

"That the cost of maintaining and operating the railway, taken together, will be less than that of operating and maintaining the canal.

"That the railway can be located and successfully operated at localities where it is not practicable to construct a canal.

"That it is possible to estimate, with great accuracy, the cost of a ship railway, and the time needed to build it, because the work would be almost wholly upon the surface of the ground, whereas the canal is strictly a hydraulic construction, involving control of water and the execution of works under water, or liable to be submerged or interrupted by water, thus rendering anything like an accurate estimate of the time and cost of its construction an impossibility. Hence capitalists cannot know, with certainty, the amount of money and time required, or what the canal will probably pay when finally finished."

These are bold and significant assertions truly; the non-professional reader may pronounce them startling and extravagant. Coming from a speculative adventurer they would be; but Mr. Eads is no adventurer. He is an engineer who has shown his practical skill as a builder of ships of heavy tonnage, railway bridges of the boldest construction, waterways of the most extensive scope, and in every great undertaking he has demonstrated a financial ability not less remarkable than his engineering capacity. Not a few of the ablest and most experienced engineers and shipbuilders of the world have pronounced this plan of a ship-railway entirely practicable, and far more economical than a canal for the same work. Indeed, the cost of one canal such as Mons. De Lesseps proposes at Panama, would build a ship railway at four or five places along the Isthmus equal in capacity to the canal and several times more speedy in its operation. Again, the interest on the excess of capital required for the construction of a ship-canal for a given traffic, over the cost of a ship-railway of equal capacity, would duplicate the road every ten years. With capital supplied as fast as needed, the railway could be put in operation without difficulty in four years from the time of beginning its construction. The working expenses of the road need not exceed 40 per cent. of its revenue, against 50 or 60 per cent. on ordinary railways.

This superior economy would be due to the fact that the work would be more compact; there would be but one roadway to keep up, everything would be built in the most substantial manner, and all the freight would be handled in mass by steam-power. The liability to accident to shipping in transit would be less than on a canal. With the estimated traffic of 5,000,000 tons a year, a charge of two dollars a ton would yield a revenue of $10,000,000. Allowing 50 per cent. for operating expenses, the net revenue would give 10 per cent. on the capital invested. A tariff of eight or ten dollars a ton would have to be charged to make a canal at water level pay as well, and such a tariff would be practically prohibitory.

MISCELLANEOUS INVENTIONS.

An improvement in the class of targets which are constructed of movable parts and connected in an electrical circuit with an instrument which is located at or near the place where the shots are fired, and is adapted to indicate the portions of the target struck by balls or bullets, has been patented by Mr. Morris Ullman, of Alexandria, Va.

A machine for bending shafts or thills for buggies and other vehicles, has been patented by Mr. John H. Smith, of Bluffton, Ind. The invention consists in a novel construction and arrangement of straps and formers, a screw, a cam lever, and a frame or table, whereby provision is made for simultaneously bending the heel and the point of both of the shafts of a pair.

An improved window and door screen has been patented by Mr. Albert F. Demorest, of Muscatine, Iowa. The object of this invention is to furnish window or door screens so constructed that they can be readily adjusted into and secured in place.

Mr. Henry Schlimme, of Wiconisco, Pa., has patented a simple and durable tuyere for blacksmith's forges and the like. It consists in a bored cylinder provided with water chambers, longitudinal blast opening, a blast pipe and sliding valve, and water feeding pipes.

An improvement in fences has been patented by Mr. Joel D. Olinger, of Water Valley, Miss. The object of this invention is to construct fences so that they can be readily moved from place to place, and to make them strong, durable and less expensive in construction than fences made in the ordinary manner.

An improved thill coupling has been patented by Mr. James S. Welch, of Dodge City, Kansas. In this invention the conical bolt which holds the thill iron is considerably longer than the width of the thill iron, and the latter is constantly pushed toward the larger end of the bolt by a U-shaped spring.

Mr. Isaiah A. Clippinger, of Plainfield, Ill., has patented an improved spring for bed bottoms, which will facilitate and cheapen their attachment to the supporting slats of the bed bottom and the attachment of the springs to each other, and effect continuity of the bearing surface.

An improvement in dynamo-electric machines, which Mr. Charles J. Van Depoele, of Detroit, Mich., has patented, consists in the peculiar construction of the revolving armature, and in the arrangement of the same in the magnetic field and the bearings carried by projections from the sides of the case.

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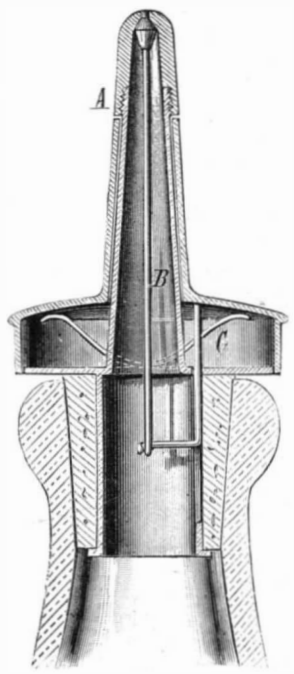
Serviette Magique.

In France, a species of cloth for polishing metal ware is manufactured under the name of serviette magique. It consists of small pieces of woolen cloth which are saturated with soap and tripoli and colored with fuchsine. It is manufactured by dissolving 60 grains of Marseilles soap in 300 grains of water and adding 30 grains of tripoli. The mixture is colored red by means of fuchsine, and the pieces of cloth are saturated in it and afterwards dried.

IMPROVED BOTTLE STOPPER.

The bottle stopper represented in the engraving consists of a flanged tube provided with a perforated screw cap, A, and a larger spring-actuated flanged tube set over the inner tube and connected with the rod, B, of the valve which closes the opening in the cap of the inner tube. It will be seen that whenever the flange, C, of the outer tube is pressed down the valve will be drawn from its seat, when the contents of the bottle may be discharged through the perforated cap.



HOUTS' BOTTLE STOPPER.

This novel bottle stopper was recently patented by Mr. John Q. Houts, of Sioux Falls, Dakota Territory.

Guatemala's Exhibition.

The largest and most enterprising of the Central American States, Guatemala, has entered the list of exhibitors, and announces the intention of holding an industrial exhibition in 1882. This is likely to furnish American manufacturers of articles suitable for the markets of that region a convenient opportunity for placing their products in a favorable way before the Guatemalan dealers and consumers.

IMPROVED BOLT FOR DOUBLE DOORS.

The engraving represents a novel bolt for double doors recently patented by Mr. William P. Brachmann, of 147 Walnut street, Philadelphia, Pa. This bolt is in the form of a right-angled lever pivoted at its angle, and provided with a spiral spring acting on its pivot, and having screws or spring pins for locking it in different positions. The bolts fit in appropriate sockets in the sill or jamb.

Fig. 1 shows the bolt applied to double doors with both doors fastened. Fig. 2 shows one door bolted and the other unfastened. Fig. 3 is an enlarged perspective view of the bolt, and Fig. 4 is a vertical section of the door and the bolts.

The bolt, A, is in the form of a right-angled lever, pivoted at its angle in a casing, B, attached to the door. Each arm of the bolt is provided with a recess for receiving the end of the spring pin, D, which serves to hold the bolt in either of its positions by engaging one or the other of the recesses. The pivot of the upper bolt is provided with a short arm to which is attached a chain for operating the bolt, and the pivot is provided with a spiral spring which tends to throw it into the position shown in Fig. 1, with one of its arms in the socket on the jamb and the other one in the socket on the other door. The chain is drawn down to throw the bolt into the position shown in Fig. 2, and to retain it in this position the ring at the end of the chain is placed on the pin projecting from the door.

The lower bolt, A', has no spring, and is kept in place by the spring pin, D'. One arm of the bolt enters the socket attached to the door, and the other enters a slotted socket in the door sill, as in Fig. 1, when both doors are bolted. When only one door is bolted, the lower bolt is in the position shown in Fig. 2.

This bolt fastens both doors with a single operation, and to securely bolt the top and bottom of both doors requires only two bolts instead of four as in the ordinary method, and the shrinking or swelling of the doors makes no difference in the operation of the bolt, as it engages a simple, open-hooked socket which admits of the lateral movement of the bolt without interfering with its working.

The bolt is made in very handsome shape, and is an ornament to the doors rather than otherwise.

The New Steamship City of Augusta.

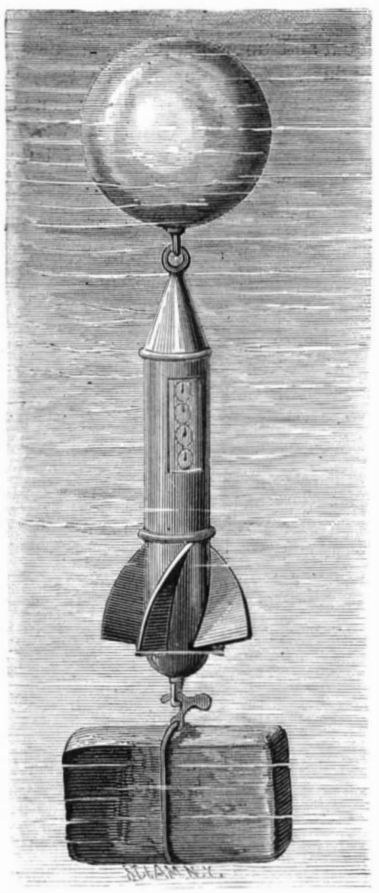
The new iron steamship City of Augusta, of the Ocean Steamship Company, is described as the largest ship engaged in the coast wise trade. Her capacity is 6,000 bales of cotton, or 3,000 tons. She is 310 feet long at the water line, 323 feet over all, and is of 40 feet beam. Her cabin accommodations are for 100 first class passengers. She is equipped with a compound engine, with two inverted cylinders, 42½ and 82 inches respectively in diameter, and each of them with 54 inches length of stroke. These engines are capable of a speed of sixty revolutions per minute. The screw is 16 feet in diameter, with 26 feet pitch. The working pressure is 100 pounds of steam. In addition to this there is an auxiliary or independent engine, with force pumps attached and an air circulating pump. Steam is furnished by six tubular steel boilers, 12½ feet in diameter and 11 feet 5 inches long, with one superheater 12½ feet in diameter and 13 feet high. These boilers are ample to furnish all the steam required for a speed of sixteen knots. There are steam steering gear, steam capstans and windlass forward and steam capstan aft, with donkey engines for freight hoists at all the holds.

The City of Augusta was built by John Roach, of Chester, under the supervision of Captain Lefevre, marine superintendent of the Ocean Steamship Company.

THE new dump car of the New England Car Company, which was illustrated in the SCIENTIFIC AMERICAN some time since, was recently tried at Brookline, Mass. The stockholders of the company and several railway men were present. The car, which was built by the Watson Manufacturing Company, is probably the longest and largest dump car in practical use in the country, and its size made the test of its workings all the stronger. It is thirty-two feet long, weighs 19,860 pounds, and contained 36,590 pounds, or over eighteen tons, of coal. All things being in readiness, a medium-sized man turned the crank, the machinery responded, the car tipped, the coal was emptied out where desired, and the car body went back into place, the whole time consumed from "the start to the finish," as one might say, being less than two minutes. The car has been tested, with like results, with loads of gravel, both damp and dry. The gentlemen present at the trial expressed themselves well pleased with the workings of the car, as well as its simplicity, strength, and durability.

DEEP SEA-SOUNDING APPARATUS.

The engraving shows an improved sounding apparatus recently patented by Paul C. Rousset, of St. Petersburg, Russia. The invention consists of a novel device for connecting the sinker with an ordinary registering log, and in the arrangement of a buoy of sufficient capacity to raise the log to the surface after the sinker has been detached.



ROUSSET'S DEEP SEA-SOUNDING APPARATUS.

The registering mechanism of the log is provided with a ratchet and pawl that prevents it from operating as the log descends, but allows the register to operate when the log ascends. A sinker is suspended from an eye on the lower end of the log by means of a hook which is weighted so that as soon as the sinker touches bottom the hook drops out of the eye, and the log being released is carried to the surface by the buoy, the screw meanwhile actuating the mechanism of the log, which records the distance through which the log passes.

This device renders a sounding wire or line unnecessary, and insures more accurate soundings than can be obtained in the ordinary way.

RECENT INVENTIONS.

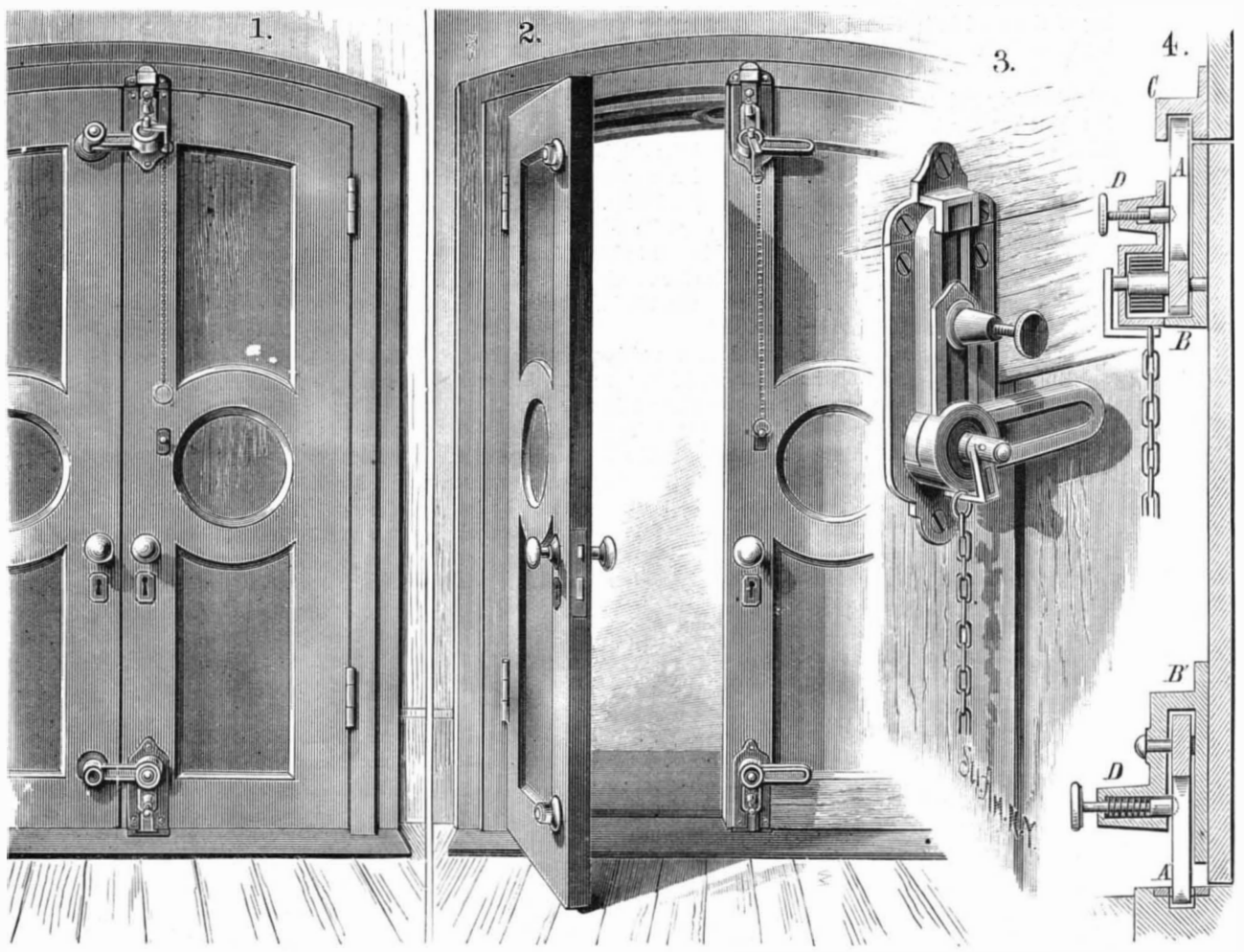
A ball and instep stretcher for boots and shoes, so constructed that it can be readily inserted into and removed from the boots and shoes, has been patented by Mr. Francis A. Fay, of Brooklyn, E. D., N. Y.

An improved milliner's steamer and presser has been patented by Mr. Thomas Hicks, Jr., of Gravesend, N. Y. This invention relates to that class of devices designed for milliners' use for the purpose of raising the pile on velvets, etc.

An improved mechanism for changing and adjusting the height of revolving seats of stools and chairs has been patented by Mr. John M. J. Wernert, of Paw Paw, Mich. The invention consists of a spring-actuated rod inclosed in a slotted cylinder that projects downward from the under side of a chair or stool seat into a grooved socket which is fixed vertically in the central standard of the stool or chair, said rod being provided on its lower end with a laterally projecting lug, which is made to engage in the grooves of the socket and thereby hold the stool or chair seat at any desired elevation.

Mr. John R. Hastings, of Lampasas, Texas, has patented a military saddle so constructed that the valises and other equipments may be connected with the saddle in such a way as to distribute and balance their weight, and at the same time make the saddle comfortable for the rider.

Mr. John S. Worth, of Coatesville, Pa., has patented an improvement in gearing for rolling mill rolls and other machinery. The invention consists in gear wheels, each of which is provided with several longitudinal rows of epicycloidal



BRACHMANN'S BOLT FOR DOUBLE DOORS.

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teeth set in echelon, the teeth of each row being in end contact or union with each other, and set so that the first tooth in any one row enters in gear with the opposite wheel while one or more teeth of the preceding row are yet in gear, whereby a majority of the sectional rows of teeth will always be engaged in the opposite wheel at one time, the precise number thus engaged depending on the number of sectional rows of teeth in the wheel, whether two, three, four, or more, also upon the height of the teeth and coarseness of the pitch.

Mr. John H. Holmes, of Charleston, Kan., has patented an improved rotary dasher or breaker for employment in vertical churns.

THE HUNTING FALCON.

Among falcons the hunting falcon is the most conspicuous on account of the great size and the striking power of its wing. This bird is a native of northern Europe, being mostly found in Iceland and Norway, and it also inhabits parts of both North and South America.

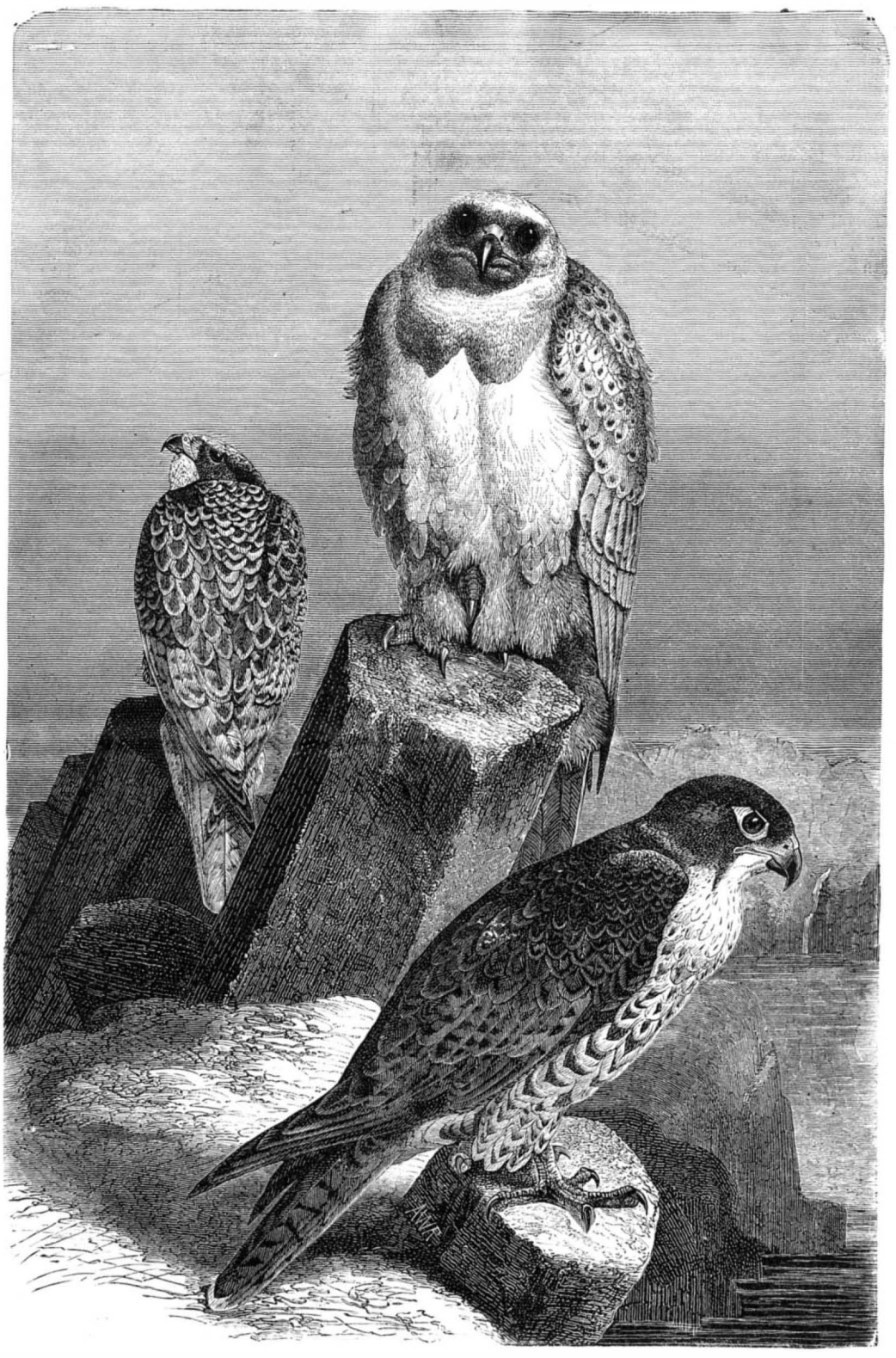
Some naturalists believe that the Norwegian and Icelandic birds ought to be reckoned as different species, but others think that any differences between them are occasioned by age and sex. The power of flight of these birds is marvelously great. When it comes within sight of its prey it bounds upward, every stroke of the wings producing a perpendicular leap, as if it were climbing a giant stairs. After having risen to the proper height it dashes itself upon its prey with a stroke that is as unerring as its motion is swift.

When at liberty it seems to prefer birds to any other kind of prey, and will resolutely attack birds of considerable size, such as herons or storks. It will also chase hares and rabbits, and in the pursuit of this swift game is so eager that after knocking over one hare it will leave the maimed animal struggling on the ground while it goes in chase of another.

Although its home is in the chilly wastes of the northern regions, the bird is in no want of food, finding ample supply in the sea birds which swarm around the tall cliffs that rise from the waves.

On account of the singular power, swiftness, and courage of this bird it was in former days held in the highest estimation, and could only be purchased at a most extravagant price. The training of this bird to fit it for the chase is a long and tedious process, requiring a longer time than the training any other bird.

The color of the adult bird is nearly white, being purely white on the under surface and flecked with grayish-brown spots on the upper side. The sharp claws are black, the beak of a bluish tint, increasing in darkness toward the point, and the cere, tarsus, and toes are yellow. When young the bird presents a different aspect, and would hardly be recognized as belonging to the same species. In its earlier life it is almost wholly of a grayish-brown tint, the feathers being slightly marked with a little white upon their edges. As the bird grows older the white edges become wider by degrees until the entire feather is of a snowy whiteness.



THE HUNTING FALCON.

Landscapes Changed by Animals.

All animals, says Professor Mivart in the *Contemporary Review*, are directly or indirectly supported by plants, and the range of plants and the very existence of species are often wonderfully affected by the appearance on the scene of even one new kind of animal. Thus a great grazing district at the Cape, called the "Midlands," was, in Burchell's time, covered with luxuriant greensward, with a few trees and bushes, with willows and acacias along the sides of its streams. The introduction of sheep first destroyed the grass and then most of the shrubs—a change which affected the rainfall, so that this region has been invaded by the hardy plants of the adjacent Karroo desert, and is fast becoming an extension of the desert itself. St. Helena, when discovered by the Portuguese, in the year 1502, was entirely covered with forests (the trees drooping over its high precipices overhanging the sea) and with a rich flora of absolutely peculiar plants. In 1513 some goats were introduced, and in fifty years had multiplied into thousands. Yet in 1709 trees still abounded, and the peculiar native ebony tree was still so abundant that it was used to burn lime with. In another hundred years (1810), the goats had entirely destroyed the great forests, yet so rich was the soil that it was hoped, with the destruction of the goats (and they were destroyed) the island would regain its wood by a quarter of a century. But this was not to be, for the government of that day most unhappily planted the island with trees and shrubs from other countries, which have so grown and spread that now the old indigenous flora is almost confined to a few patches on the central ridge of the island, at a height of 2,700 feet. What has been lost may be judged by the fact that of the forty-five kinds of flowering plants and twenty-three species of ferns which yet survive, no less than forty of the former and thirteen of the latter are absolutely peculiar to the island.

Preserving Timber in Ground.

In speaking of the well known methods of preserving posts and wood which are partly embedded in the earth, by charring and coating with tar, it is said these methods are only effective when both are applied. Should the poles only be charred without the subsequent treatment with tar, the charcoal formation on the surface would only act as an absorber of the moisture, and, if anything, only hasten the decay. By applying a coating of tar without previously charring, the tar would only form a casing about the wood, nor would it penetrate to the depths which the absorbing properties of the charcoal surface would insure. Wood that is exposed to the action of water or let into the ground should first be charred, and then, before it has entirely cooled, be treated with tar till the wood is thoroughly impregnated. The acetic acid and oils contained in the tar are evaporated by the heat, and only the resin left behind, which penetrates the pores of the wood and forms an air-tight and waterproof envelope. It is important to impregnate the poles a little above the line of exposure, for here it is that the action of decay affects the wood first, and where the break always occurs when removed from the earth or strained in testing.

Taking Care of Fresh Meat.

The time for slaughtering beef and pork for home consumption is close at hand, and it is a busy time for housekeepers; and if the truth is told, it is not a very pleasant task to contemplate; but as the comfort and happiness of a family depend very much on the manner in which meats are prepared, it is an essential item in every farmhouse that it should be done in a judicious and proper manner.

It is to be hoped that the good man of the family is both competent and willing to cut up the meat when cool without the assistance of his wife, and also to pack and salt the pork in the barrels in the cellar. If he does not know how, it would be highly advisable for him to take a few lessons of an experienced teacher, for it is a job that no woman ever ought to attempt. She of course would see that the pork barrel was perfectly sweet and clean before it was used. The brine, if kept nicely, will answer to use year after year by scalding and skimming and letting stand till cold before turning it over the pork. Pork must be cold before it is packed—all the animal heat entirely out of it—then, when packed down, an abundance of good coarse salt must be freely spread over every layer of the pork, then allow it to stand two or three days before turning on the brine. Place a heavy flat stone on the top of the barrel, so that the meat will be kept solid in its place. It is best to keep the stone on meat the year round, so that none of the pieces can float on the brine, as they are apt to do unless kept in place by a heavy weight. Have the brine cover the entire mass of pork, so as to exclude air. There is so much lean meat in the hams and shoulders of a hog, that they never ought to be salted with the solid pork. A pickle should be made expressly for their curing, as they can be made so much more palatable than when simply salted. The spare ribs of pork are better to be frozen and kept fresh until needed for cooking. The tenderloin can be frozen, too, and it is one of the most delicious parts of the whole, either broiled and buttered or fried. The head needs to be cleaned nicely, and soaked in a weak brine till the blood is all out. Some like it boiled, and others prefer it made into head-cheese and kept for cold meats. The feet and legs are to be scraped thoroughly, boiled till tender, and prepared as souse, or eaten hot, with turnip sauce for a relish. The trimmings of the pork—the neck pieces and the jowls—are nice made into sausages, and they keep all through the winter, to use at pleasure. The lard of course needs care immediately, but it is much better to let it soak in water over night before trying it out. Always keep the roundabout and leaf separate, and use the lard from the roundabout in cold weather, as it is liable to have a strong taste if kept till summer. The tongue and heart make good meat for mince pies, and the liver is palatable and wholesome, either boiled or fried. Beef that is kept fresh for winter use ought to be frozen as soon as possible, and then packed in tight barrels and set in a cool place, where the changes of atmosphere will not reach it. Some bury the barrel in an oat bin; others cover it with snow or put it in the hay mow—the main object being to keep it from thawing out. Beef hams must be cured in a nice pickle for some six or eight weeks, and then taken out and drained, put into either cloth or paper bags, and hung near the kitchen stove to dry for summer use; the tongue can be pickled with the hams, and kept for any length of time. The neck pieces and heart are used for mince pies, and need a thorough soaking in water to extract the blood. The beef to corn must be soaked two or three days in a weak brine, then packed in a tight cask or barrel, with salt sprinkled freely between the layers, and held down by a stone, in a pickle made and poured over it. It should be kept in a cool place in the cellar during the summer, and a sprinkling of black pepper over the top of the brine will keep the flies at a distance.

There is a great amount of work and care required to keep a year's stock of meat in good, wholesome condition, but if it is properly cured to commence with, two thirds of the labor is saved, and all the worry. No farmer can afford to

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patronize either the meat cart or the market for a supply of meat through the year. It is more convenient as well as more economical to lay in a store for family use that has been fattened at home, and then you are sure you have a good article, that is safe to use.—*Farmer's Wife in Country Gentleman.*

THE NUTRITION OF ROOTS.

The microscope does not show openings in the cellular tissues of a root through which even the most minute particle of solid matter could pass, and there is no mechanical power that could pulverize any solid so fine that it could pass through those extremely small canals which enable the root to absorb nourishment in a liquid or gaseous form.

For a long time the absorbing power was supposed to be localized in a special organ at the end of the root. But this has been disproved, as the vegetable cone situated there is covered with a skin that possesses little or no power of absorption.

The maximum of absorption takes place directly above this cone, in a part of the root covered with peculiar fibers. In ascending the root these fibers gradually diminish and disappear, and higher still the skin itself exfoliated, and is replaced by a new tegument that grows less and less permeable with age. Both the anatomy of the plant and experiment prove that the absorbing power diminishes from the point to the base of the root.

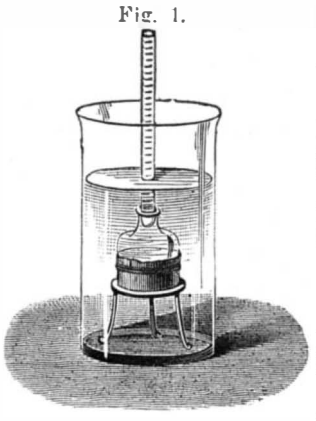
The subterraneous nutritive fluid of the soil is always very poor in plant building substances, of which it only contains from a few thousandths to one hundredth of its own weight. The plant soon exhausts the small amount of soluble matter contained in arable land, but this matter is daily renewed by the chemical action of sunlight, and the various natural agents cause a sort of digestion to take place in the soil, converting insoluble into soluble bodies. The fertility of the soil is not shown by the amount of nutritive matter that it can dissolve at a given moment in water, but by the amount of matter it contains that with time will become soluble. We should, therefore, remember in applying liquid fertilizers that they should be largely diluted if we would imitate the natural conditions of vegetation.

All roots possess an elective power of absorption, as they will only absorb those substances that are suitable to nourish them, and reject all others. Each plant, so to speak, follows a diet appropriate to its own organization and character, and generally when the soil does not contain the necessary elements the plant, instead of adapting its chemical condition to that of the soil, will suffer and prematurely die.

We do not yet fully understand the mechanism of this elective absorption, but we are sure that the force of endosmose enters largely into the phenomenon. This force is shown in the following experiment:

Take a glass bottle (see Fig. 1) from which the bottom has been removed and replaced by some vegetable or animal membrane, fill it with some uncrystallizable solution, such as gum arabic, and close it with a cork, in which is inserted a glass tube open at both ends. If this apparatus is placed in pure water the solution gradually mounts in the tube, proving that the water has penetrated through the membrane and augmented the volume of liquid in the bottle. This property of membranous tissues, by which liquids of unequal densities are enabled to percolate through it and intermix, is called the force of endosmose, and was first observed by Durochet. The instrument that exhibits and measures the force is the endosmometer. The cells of the root act toward the soil and in regard to each other as minute endosmometers; and formerly it was assumed that the force of endosmase was the only power that introduced the water from the soil into the root, and caused its circulation through the plant. But this explanation is insufficient, because during the summer, when the circulation of the sap is the most rapid, the cells of the plant contain gas, and consequently are not perfect endosmometers.

Fig. 1.



But if the causes of absorption by the roots are obscure, its effect is well known, for we have observed that the power which forces the sap upward into the tree is very great, and can easily be measured by a "mercurial manometer."

This is a glass tube, in the form of a *v* (see Fig. 2), with unequal ends, both of which are open. The shorter end is enlarged in the middle so as to form a small reservoir, and is bent at right angles. If mercury is poured into the tube, until it half fills the reservoir, the mercury will remain at the same level on both sides.

If we wish to know the force of the sap as it rises from the root into the trunk, we cut the latter close to the ground and inclose the end of the stump in a glass cylinder, in one side of which is inserted the small end of the manometer. Fill the cylinder with water and lock it. When the instrument is thus arranged, the varying pressure of the sap is indicated by the rise of the mercury, and it is easy to calculate the exact force.

The pressure of the sap at different heights can be known by simply inserting the manometer in the side of the tree, as shown in Fig. 4.

Numerous observations have proved to us that the propulsive force of the roots, like all vital forces, is subject to variations produced either by external or internal causes.

Fig. 2.

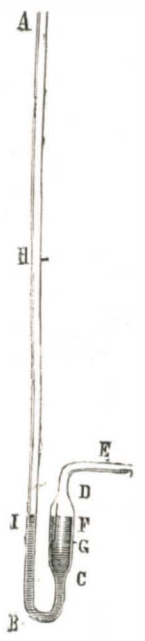
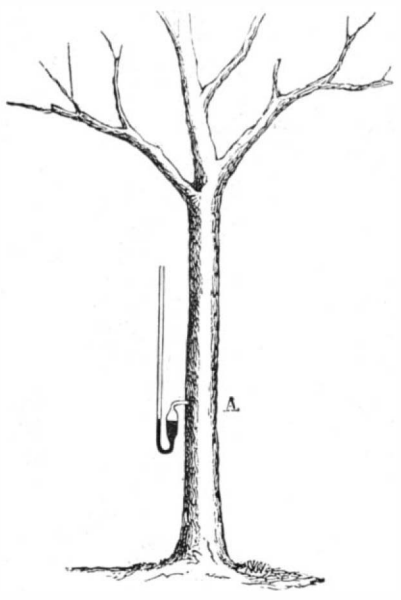


Fig. 3.

The strongest pressure observed by Hules (April, 1725) was equivalent to three-tenths of an atmospheric pressure. Since then still stronger pressures have been observed, in some instances to the pressure of one and a half atmospheres.

The propulsive force of the sap occasionally produces a curious phenomenon called the oozing sap. A little drop resembling pure water collects on the end of the leaf, and

Fig. 4.



gradually enlarges till it falls, and is replaced by another. This takes place intermittently, and generally during the night or after a copious rainfall.

This phenomenon of the oozing sap can be artificially produced by forcibly injecting water into the bark of the tree.

Fig. 5.

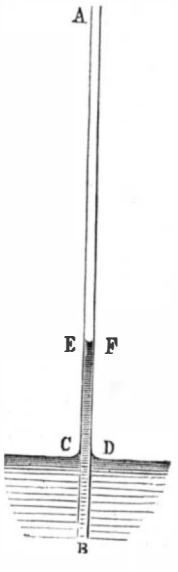


Fig. 6.

Soon after, drops of water will be seen issuing from the surface of the bark.

Sometimes this propulsive force suddenly disappears, and gives place to the opposite force of absorption, as may be seen in the following experiment. If, at the close of a warm summer day, when its transferation has been abundant, the plant is cut down to the ground, and a glass cylinder full of water fastened on the stump, the water will be seen to gradually diminish and disappear. The root will absorb it through the cut surface, just as a branch will absorb through its lower section when it is placed in water. In each case the cause is the same, the insufficiency of water in the tissues of the root or branch

The varying operation of these two forces can be seen by a manometer inserted in the tree. In the morning the mercury descends in the longer side of the instrument, thus showing the absorbing force of the tree, and later, again changes its level and registers the opposite force, which increases during the day, especially if the rays of the sun fall on that side of the tree where the manometer is inserted.

Capillary attraction is another motive force in the circulation and movement of the sap. The most familiar illustration of this force is to take a very small glass tube and plunge one end of it in water. The liquid will immediately rise in the tube above the level of the surrounding water, to a height proportionate to the diameter of the tube, and the smaller the diameter the higher the liquid will mount.

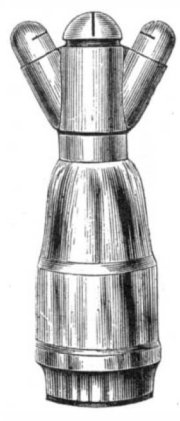
It is generally admitted that capillary attraction is one of the principal causes of the ascension of the sap. Still it is necessary to recollect that during the period of the most rapid movement of the sap, the veins and fibers do not contain unbroken columns of water, but are filled alternately with drops of water and bubbles of air, and later in the season only with air, as shown in Fig. 6.

The capillary phenomena in the plant are of a complex nature, and vary according to the time of the year, and heat, especially solar, dilates the interior gases of the plant, and by increasing their elastic force exercises a great influence on these phenomena, for the sap always percolates more abundantly through the insertions made in the tree when the sun falls warmly upon it.

IMPROVED GAS BURNER.

The accompanying engraving represents a new form of gas burner invented by Dr. McGeorge. It is claimed that it is very economical in burning gas, and secures complete combustion. It is well known that ordinary burners, because of imperfect combustion, throw off a great deal of poisonous carbonic oxide and carbonic acid gas, which vitiates the atmosphere very rapidly. The burner shown in the annexed engraving secures a more perfect combustion of gas, and thus diminishes the formation of poisonous gases, and at the same time, as shown by careful tests, an increase of fifty per cent in illuminating power secured by perfecting combustion alone, the quantity of gas consumed remaining the same.

In this gas burner, which has been named the "focus gas burner," two small side jets are directed to a point at the base of the flame, throwing heated gas mixed with air. By this means the gas is greatly rarefied and expanded, and an additional amount of oxygen is conveyed to the flame. The particles of carbon or blue portion of flame (the gas being superheated) are reduced so as to eliminate the greatest amount of light. This more perfect combustion also checks the outflow of carbonic acid gas.



Gas, like steam, admits of expansion by heat to almost any limit. The more the particles are heated and separated, the more perfect combustion is secured, and a larger proportion of light is produced.

If a regulator is used, a sufficient pressure is given through it to carry the burner to complete combustion. This pressure is offset in the "focus burner" by a novel check, which is very simple and effective. No complicated valves nor inside apparatus, which are liable to become smutty and fill up, are used.

The inventor gives the following photometric test, made in May last, at one inch pressure: A common burner, placed upon the test, gave an hourly consumption of 2 feet; light emitted equal to 6 star candles. The "focus burner," with the same amount of gas; light emitted equal to 11¾ candles.

Further information may be obtained from J. C. O. Redington, General Manager, 27 Park Place, New York.

Telegraphy Between Australia and London.

On the 1st of October last, a message of sixty-nine words was forwarded by the Governor of Victoria announcing the opening of the Melbourne Exhibition on that day. The message was dispatched from Melbourne at 1 P.M., and reached London at 3:43 A.M., on the same day, or 9 hours 17 minutes before the hour of its despatch. Allowing, however, for the difference of time between the two cities, it occupied only twenty-three minutes in transit. The route of the message was over the lines of the Victorian and South Australian colonies, the cables of the Eastern Extension, Australasia, and China Telegraph Company, the lines of the Indian Government, the cables of the Eastern Telegraph Company, and the lines of the Egyptian and French Governments, and the rapidity of its transmission shows the harmony with which these various administrations work together. The total distance traversed was 13,398 miles.

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DECISIONS RELATING TO PATENTS AND TRADE MARKS.

By the Commissioner of Patents.

(*Appeal from the Examiners-in-Chief.*)

HARRISON *et al. vs.* HOGAN *et al.*—HEELING MACHINE.

Application of Hall and Harrison filed March 20, 1879. Application of R. M. Harrison filed February 8, 1879. Patent No. 206,237, to Hogan and Whitlock, granted July 23, 1878.

Marble, Commissioner:

1. As between an employer and a party employed for a special purpose, features suggested by the employe which are merely tributary to the main invention can give to him no claim as an inventor, and in regard to such features as amount to independent inventions a presumption exists in favor of the employer.

2. An award of priority cannot be rendered in favor of joint inventors as to a part of a machine which is in itself a distinct improvement capable of supporting a separate patent, and in the conception and completion of which one of such joint inventors had no part.

It is a familiar doctrine that as between an employer and a party employed for a special purpose matters merely auxiliary or tributary to the main invention can give to the employe no claim as an inventor, and in regard to such features as amount to independent inventions a presumption exists in favor of the employer as the author of the same which can only be overcome by conclusive and unequivocal proof. The stop used in connection with the slide is a feature which, in my judgment, cannot be said to be more than tributary to the invention of the slide, the movement of which it is designed to regulate. The conception of the one naturally followed that of the other, and even if this feature was added by the workmen it is not such a distinct invention as would warrant them to make claim to the same. Were this otherwise, however—were the stop other than a tributary element—the weight of evidence satisfies me that the patentees are the parties rightfully entitled thereto.

By the Commissioner of Patents.—Trade Mark Decisions.

EX PARTE HEYMAN.

Marble, Commissioner.

1. The law is well settled that words merely descriptively used are not proper subjects for trade mark registration.

2. If the descriptive character that might attach to a word is so very remote as to be but secondary, so that the word will be understood by the public not as a descriptive but as a fanciful term, it may then constitute a valid trade mark.

Abstract.—The applicant in this case seeks to register the word "Invigorator" as a trade mark for spring bed bottoms. The registry is denied by the Examiner on the ground that "the word in question is, in a certain sense, descriptively used by the applicant; or the objection may be stated in another form, that the word is not distinctly an arbitrary designation, and hence would not serve the purpose of indicating the original ownership of the articles to which it is designed to be affixed."

It is undoubtedly a well settled rule of law that words that are merely descriptively used are not proper subjects for trade mark registration. If, however, the descriptive character that might attach to a word is so very remote as to be but secondary, so that the word will be understood by the public not as a descriptive but as a fanciful term, it will then accomplish the office of a trade mark, and to the use of a word which in connection with a particular article is primarily fanciful an exclusive right can exist. Indeed, it is common to find words, either newly coined or arbitrarily selected, the validity of which as trade marks has been sustained by the courts, which contain a suggestion more or less remote of some peculiarity, real or supposed, of the article to which they are attached. An example of this is afforded by the case of *Davis vs. Kendall* (American Trade Mark Cases, 112), where the term "Painkiller" was held to be a proper trade mark as applied to a medical compound.

I do not think that the word "Invigorator" stamped upon spring bed bottoms could be regarded as merely descriptive. It is true, perhaps, that by a process of logical deduction it may be resolved into a description in one sense, since a spring bed bottom may be conducive of sleep, and sleep invigorates; but, in my judgment, the primary signification which the public would attach to this term would be a fanciful one.

The decision of the Examiner is reversed.

EX PARTE OLIVER.

Application of R. W. Oliver and J. E. Robinson filed March 3, 1880.

Marble, Commissioner:

A geographical name, although also the name of a historical personage, is not a proper subject for trade mark registration.

Applicants in this case seek to register the word "Raleigh" as a trade mark for manufactured tobacco, whether such word be accompanied by a portrait of Sir Walter Raleigh or not. The Examiner holds the word alone to be geographically descriptive when used upon tobacco, it being a name of a leading city of a tobacco growing State, and he has accordingly refused the registration.

It is contended on behalf of the applicants that the word as here used is the name of an historical personage, and that it would be more likely to be associated with the person than with the place of that name. In this statement of counsel I cannot concur. Situated as the city of Raleigh is, in the center of a tobacco growing region, the vast majority of persons, and especially the inhabitants of that section of the country, as well as many elsewhere whose historical knowledge is defective, would, I think, regard this word as indicative of the place of manufacture. The mere circumstance that the name of a place is also the name of a person cannot alter the fact that any manufacturer of tobacco in Raleigh, and there are doubtless such there, would have a perfect right to use this mark upon his wares, thus destroying the exclusiveness of the right of user—an essential feature in a lawful trade mark—nor the fact that many, and I think most, persons would understand the mark as geographically descriptive. The authorities are numerous and conclusive upon the point that, as a rule, geographical names are not proper subjects of trade marks. (*Ex parte Knapp*, 16 O. G., 318; *Marsching & Co.*, 15 O. G., 294; *Cornwall & Bros.*, 12 O. G., 312.) There have been, it is true, exceptions to this rule, where the geographical words employed were obviously fancifully used, and were of such a character that they could not be misunderstood as indicating the locality in which the goods were made; but this cannot, in my judgment, come under the excepted cases.

The decision of the Acting Examiner of Trade Marks is affirmed.

STRAITON & STORM.

Application of Straiton & Storm filed August 20, 1879.

Marble, Commissoner:

1. A band or ribbon of such shape and so attached to the wares of a manufacturer as to enable them to be readily distinguished in the market may properly be allowed registration as a trade mark.

2. The mere fact that such strip or ribbon may also be the vehicle of other matter cannot detract from its efficiency as a means of distinguishing the goods upon which it is placed.

Abstract.—Applicants in this case seek to register as a trade mark for cigars—

"A waved band or ribbon of rectilinear form longer than it is wide, which is fastened to the two ends of a cigar box, and so placed with reference to the cigars within the box as to be below some of said cigars and abo e the remaining cigars."

The Examiner denies the registration for the reason, as he states in answer to applicants' appeal, that—

"The matter sought to be registered does not amount to an arbitrary symbol, the band or label serving the office of a mere label, which, besides the descriptive matter contained thereupon, may also contain matter indicative of origin and owuership, and thus serve as the vehicle of a lawful trade mark. A contrivance, design, device, name, symbol, or other thing, to be a lawful trade mark, must be of such a character that its employment in connection with a particular commodity will indicate the origin and ownership of that commodity."

There have been numerous definitions of a trade mark, the difficulty seeming to be to find one sufficiently comprehensive to embrace the many means which a manufacturer may employ to distinguish his wares. The Acting Commissioner in the Gordon case before referred to, says:

"Thus a box, barrel, or wrapper containing merchandise, whatever its form, cannot, *per se*, be a trade mark, but a name, symbol, figure, letter, form, or device cut, stamped, cast, impressed, or engraved thereto, or in some other manner attached thereon or connected with the article itself, may be a proper trade mark."

This statement is fully sustained by the case of *Moorman vs. Hoge* (2 Sawyer, 78), to which reference is there made. Surely under so broad a definition applicants' mark must find some place. It is a "device" "attached to the box and connected with the article itself" for the purpose of indicating the origin of the goods. Will it serve this purpose? An inspection of the illustration at such a distance that the printed matter contained on the band cannot be read shows at a glance that applicants have attached to their wares a device by which it can be readily distinguished from the wares of another. This is the purpose of a trade mark, and this purpose applicants have, in my judgment, accomplished by a means which is clearly comprehended under all the authoritive definitions of a lawful trade mark. In the case of Gordon the following language occurs, which, although but a dictum, is here in point:

"Perhaps this objection (the useful functions of the mouthpiece of the cigarette) would not lie if, as in the case cited by applicants—that of Mommer, for which a trade mark was granted for a silk band around a champagne bottle—a silk band was attached to the cigarette, or a colored piece of paper or similar device connected therewith, for in such instance the device would answer no other purpose than that of a trade mark—perform no mechanical function."

This language would seem to recognize the propriety of granting registration for such marks as applicants'.

The mere fact that applicants' strip can be made the vehicle of other matter which may constitute a trade mark does not detract from the efficiency of the strip itself as a means or device for distinguishing the wares upon which it is placed. The same objection might be urged to a figure in the form of a star or crescent or other fanciful shape, for upon such, as upon applicants' strip, a trade mark might be stamped, and yet these fanciful figures without any matter marked thereon would certainly be understood as distinguishing marks in the trade as trade marks. The Office has repeatedly allowed the registration of strips, either of peculiar shape or attached in some distinctive manner to various articles, as appears by the numerous cases to which my attention has been drawn.

The decision of the Examiner is reversed.

Complaints about the Patent Laws.

There is a growing disposition in some branches of industry in this country to find fault with our patent laws, and the manner in which they are enforced. There is hardly a trade that has not at frequent periods its crop of harassing patent suits, which perplex the manufacturer, the dealer, and the consumer. It is not surprising, therefore, that the dissatisfaction thus created finds expression in complaints. Naturally, the subject comes up before the associations formed among those belonging to the various trades for their mutual protection and the advancement of common interests. A committee is appointed, and, if its members are in earnest, a report is drawn up suggesting possible measures of reform. Such has been the course pursued by the millers, and we learn that the brewers have taken the first steps in that direction.

All this is very well in its way, but it does not seem as though the agitation of the subject is conducted in the manner best calculated to secure the reforms desired. The reports of such committees are so evidently biased by the interests of the members, as defendants in patent suits, as to have, as the rule, little or no value. The one great and sole object of their effort seems to be to beat the particular patent or patents which menace them, and the fact is lost sight of that it is to the interest of every enterprising manufacturer to aid in sustaining patents. In many cases where complaint against the patent system is loudest, known rights have been infringed, and the protests of patentees disregarded, in the belief that it was cheaper to take the chances of infringing than to recognize the demands of those whose claims were disregarded. Patents thus ignored almost always acquire an unexpected value before they expire, and it is quite usual for them to be made the basis of expensive suits. Often they are sustained by the courts and become very valuable, for the simple reason that they have been infringed without regard to consequences. Manufacturers who find themselves figuring as defendants in suits of this character commonly have a great deal to say about the injustice of our patent laws.

Perhaps they are unjust in their requirements in some instances, but to modify them in any essential particular, in points touching the value of valid patents, would be to destroy an immense property right, and to make it extremely difficult for inventors or the owner of a patent acquired by purchase to protect himself in the enjoyment of the rights it is designed to secure to him. It may be vexatious to settle or defend frequent demands for royalties and damages; but it is still more so to know that you have valuable rights in patents which you are unable to enforce, and that which should belong to you alone has become common property. The only safe and honorable position for the manufacturer is one of justice and fair dealing. He should act advisedly with regard to the payment of royalties and the infringement of patents. If he manifests a fair and liberal disposition in this matter, and a willingness to recognize the rights of others as beginning where his own rights cease, he is not likely to have serious trouble. As the rule, it is cheaper to purchase a right under a patent than to defend an infringement; but when a manufacturer persistently disregards notices and warnings, and takes his chances as an infringer, he should stand by the consequences like a man, and not whine nor complain if called upon to pay for what he has taken without leave. He may, at least, have the satisfaction of knowing, under such circumstances, that every decision of the courts affirming the validity of patents increases the value of those he owns and controls, and that he has thus a direct interest in sustaining all good patents. But then we must make some allowance for human nature, and it certainly does make a great difference in a man's feelings whether he appears as plaintiff or defendant in a patent suit. He often does and says a great many things when he is defending an infringement suit which he would be very sorry to have quoted against him should he ever find it necessary to move for the protection of his own rights and interests. Our patent laws may be susceptible of improvement, but the men to improve them are not found on committees representing cliques of defendants interested in suits brought to recover damages for the wholesale infringement of valid patents. What they have to say may always be taken with some allowance.—*Iron Age.*

Shooting at Balloons.

English papers report some experiments, lately made at Dungeness, which show remarkable success in reducing the efficiency of military balloons. An ordinary service balloon was used, and after it had risen to a height of 800 feet was fired at with an 8 inch howitzer at a distance of 2,000 yards. The gunners were not instructed as to the precise range, but were required to find it for themselves. An 8-inch shell was accordingly fired into the air as a trial shot, and this, despite the novelty of the target, sufficed to supply the gunners with the necessary information. The next shot brought down the balloon. The projectile was a shrapnell shell, and the fuse had been so well timed that the shell burst just in front of the balloon, projecting something like 300 bullets through the fabric, and causing its immediate descent.

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The great advantage of the genuine Asbestos Coverings for Steam Pipes, Boilers, etc., over any other forms of non-conducting coverings, aside from their superior effectiveness and fireproof qualities, is that they are manufactured in convenient form, ready for use, and can be easily applied without the aid of skilled labor. The H. W. Johns M'f'g Co., 87 Maiden Lane, New York, are the patentees and sole manufacturers.

☞ *All infringements will be prosecuted to the full extent of the law.*

We unhesitatingly pronounce Messrs. Boomer & Boschert's Cider Press the best one in daily use at Am. Inst. Fair. New York Office, 15 Park Row.

Rubber Hose and Linen Hose; all sizes in stock and to order. Greene, Tweed & Co., 118 Chambers St., N. Y.

Pays well on small investments.—Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions and parlor entertainments. Send stamp for 116 page catalogue to McAllister, M'f'g. Optician, 49 Nassau St., New York.

Contractors Supplies Co. First hands. 8 Liberty St., N.Y.

Metal Pattern Letters for Foundrymen, at reduced rates, manuf'd by H. W. Knight, Seneca Falls, N. Y.

Jenkins' Patent Gauge Lock; best in use. Illustrated circular free. A. W. Cadman & Co., Pittsburg, Pa.

Mr. Ely, of Afton, N. J., cut thirteen acres of heavy grass in five hours, July 2, with the Eureka Mowing Machine. It is the best mower made. Farmers send for illustrated circular to Eureka Mower Co., Towanda, Pa.

Parties desirous of contracting for the construction of Wells of extra large capacity, may address P. O. Box 1150, New Haven, Conn.

For Sale, on account of increase of power, one 20 x 48 Corliss Engine, with three boilers and equipment complete. Now in use, but deliverable in November next. For particulars address Natchez Cotton Mills Company, Natchez, Miss.

The E. Stebbins Manuf'g Co. (Brightwood, P. O.), Springfield, Mass., are prepared to furnish all kinds of Brass and Composition Castings at short notice; also Babbitt Metal. The quality of the work is what has given this foundry its high reputation. All work guaranteed.

Saw Mill Machinery. Stearns Mfg. Co. See p. 269.

Nickel Anodes, Nickel Salts, Pumice Stone, Rouge, & Composition for Polishers. Greene, Tweed & Co., N.Y.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

The Tools, Fixtures, and Patterns of the Taunton Foundry and Machine Company for sale, by the George Place Machinery Agency, 121 Chambers St., New York.

Improved Rock Drills and Air Compressors. Illustrated catalogues and information gladly furnished. Address Ingersoll Rock Drill Co., 1½ Park Place, N. Y.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Packing once tried always used. Phœnix Packing from 1-16 up in spools or on coils. Phœnix Packing Company, 108 Liberty St., N. Y.

Blake "Lion and Eagle" Imp'd Crusher. See p. 269.

Rubber Packing, Soap Stone Packing, Empire Gum Core Packing; quantities to suit. Greene, Tweed & Co.

Gas Machines.—Be sure that you never buy one until you have circulars from Terril's Underground Meter Gas Machine, 39 Dey St., New York.

Experts in Patent Causes and Mechanical Counsel Park Benjamin & Bro., 50 Astor House, New York.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Peck's Patent Drop Press. See adv., page 268.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Eagle Anvils, 10 cents per pound. Fully warranted.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N.Y.

Wiley & Russell M'f'g Co. See adv., p. 269.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

For Sale, ready for instant delivery, 16″ x 42″ Corliss Beam Engine, 16′ x 2′ wheel, thorough repair. Price, f. o. b. at tide water, in New England, $1,250. S. C. Forsaith & Co., Manchester, N. H.

Gun Powder Pile Drivers. Thos. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

Light and Fine Machinery to order. Foot Lathe catalogue for stamp. Chase & Woodman, Newark, N. J.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

For Patent Shapers and Planers, see ills. adv. p. 284.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

H. A. Lee's Moulding Machines, Worcester, Mass.

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Reed's Sectional Covering for steam surfaces; any one can apply it; can be removed and replaced without injury. J. A. Locke, Agt., 32 Cortlandt St., N. Y.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 284.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 284.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 284.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 284.

For Separators, Farm & Vertical Engines, see adv. p. 220.

Steam Engines, Boilers, Portable Railroads, Sugar Mills. Atlantic Steam Engine Works, Brooklyn, N. Y.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Air Compressors. Clayton Stm. Pump W'ks, Bk'lyn, N.Y.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 300.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 301.

Gear Wheels for Models (list free); experimental and model work, dies and punches, metal cutting, manufacturing, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 301.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Houston's Four-Sided Moulder. See adv., page 301.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 141.

New Economizer Portable Engine. See illus. adv. p. 301.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 301. Totten & Co., Pittsburg.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N.J.

Vacuum Cylinder Oils. See adv., page 301.

NEW BOOKS AND PUBLICATIONS.

ANALES DEL MINISTERIO DE FOMENTO DE LA REPUBLICA MEXICANA. Tomo iii. Mexico, 1880.

The beautifully printed, large octavo volume of 560 pages before us, forms the second part of the third volume of the Annals of the Minister of Public Works, and contains the reports made to that officer by various officials in charge of different departments of national scientific work. About one-third of the volume is devoted to reports of the scientists who were appointed to co-operate with Captain Shufeldt, U. S. N., in his reconnoissance of the Isthmus of Tehuantepec to ascertain the feasibility of constructing across it an interoceanic canal, and gives a narrative of the expedition, an account of the geology and flora of the Isthmus, the astronomical and topographical operations, and a discussion of the probabilities as to the construction of the canal there; the reports being illustrated with numerous topographical and geological maps and sketches. The other papers are: A report of the Engineer of Mines on an alleged deposit of tin in the State of Guerrero; an exhaustive report of the same official on the mines of Guadaleagar, in the State of San Luis Potosi; a voluminous memoir by the Director of the National Astronomical Observatory of Chapultepec, showing the scientific work accomplished in that institution from its inception in 1878 up to December, 1879; and a report of the Engineer of Mines on the results of a geological and mineralogical exploration of the Sierra Mojada, illustrated with maps and with plates of the fossils observed. The volume as a whole is of considerable scientific interest, and is in every way highly creditable to the government officials of our neighboring republic, who are encouraging and vigorously pushing forward these valuable researches.

MANUAL OF CATTLE-FEEDING. By Henry P. Armsby, Ph.D. New York: John Wiley & Co.

A treatise on animal nutrition and the chemistry of food-stuffs in their application to the feeding of farm animals. The work is based on the researches of Wolff Kühn, and other recent German investigators; and is intended not only to give such practical information as to economical stock feeding as may be of value to American farmers, but also such scientific instruction as shall enable the intelligent student to make good use of the results of new investigations.

THE PRINCIPLES OF THERMODYNAMICS, WITH SPECIAL APPLICATIONS TO HOT AIR, GAS, AND STEAM ENGINES. By Robert Röntgen. Translated and enlarged by A. Jay Du Bois, Ph.D. New York: John Wiley & Son.

In using the work of Röntgen in his classes in the Sheffield Scientific School of Yale College, Professor Du Bois has had occasion to supplement it with matter drawn from other sources. Among these additions, which appear in this volume, are two lectures by Professor E. Verdet upon the Mechanical Theory of Heat, an abstract of Pernolet's work on Air Compressors and Compressed Air Engines, and Zeuner's Theory of Superheated Steam.

HYGIENE AND TREATMENT OF CATARRH. By Thomas F. Rumbold, M.D. St. Louis: Geo. O. Rumbold & Co.

Sets forth in a plain and practical way such hygienic and sanative measures for the prevention and cure of chronic catarrhal inflammation of the nose, throat, and ears as the author's professional experience has proved to be beneficial to his patients. Much space is given to the influence of tobacco in predisposing to catarrhal diseases and preventing the cure of such complaints.

THE AUTHORSHIP OF THE FOURTH GOSPEL: EXTERNAL EVIDENCES. By Ezra Abbot, D.D., LL.D. Boston: Geo. H. Ellis.

Reproduces in convenient form the series of articles on this subject in the *Unitarian Review* of February, March, and June, 1880.

AMERICAN NEWSPAPER DIRECTORY, 1880. New York. George P. Rowell & Co.

From this directory it appears that there are published in the United States and British America, 10,287 periodicals, divided as follows: Daily, 901; tri-weekly, 69; semi-weekly, 147; weekly, 7,997; bi-weekly, 46; semi-monthly, 129; monthly, 921; bi-monthly, 17; quarterly, 57.

THE MECHANICAL TREATMENT OF THE MORE COMMON ABNORMAL CONDITIONS OF THE FOOT. By C. F. Stillman, M.S., M.D. 8vo, paper, pp. 16. Reprinted from the Transactions of the Medical Society of New Jersey.

Describes the physiological conditions which should govern the construction of mechanical devices for the treatments of weak ankles, inverted feet, and the common forms of club foot.

LIGHT AND HEAT. THE MANIFESTATIONS TO OUR SENSE OF THE TWO OPPOSITE FORCES OF ATTRACTION AND REPULSION IN NATURE. By Captain W. Sedgwick, R.E. London: C. F. Hodgson & Co.

On the basis of two or three simple observations, the meaning of which he misunderstands, Captain Sedgwick tries to make out that light and heat are the two all-controlling opposite forces in nature.

CIRCULAR No. 3. BUREAU OF EDUCATION, 1880. Washington: Government Printing Office.

A valuable summary of the legal rights of children; the first part treating the rights of children in general; the second part giving a comparative view of the system of education in the different States.

SPONS' ENCYCLOPEDIA OF THE INDUSTRIAL ARTS, MANUFACTURES, AND COMMERCIAL PRODUCTS. London and New York: E. & F. N. Spon. In 30 parts, 75 cents each.

Parts 12, 13, and 14 of the encyclopedia contain articles on coffee, cork, cotton manufacture, drugs, dyeing, electro-metallurgy, and explosives.

THE LOCOMOTIVE ENGINEER'S TORCH. By Frank C. Smith. New York: George H. Frost. pp. 59.

A pocket book of practical instruction for engine drivers. The author frankly defines its province as "simply to discuss such points of interest to the locomotive engineer as the writer happens to be acquainted with."

MANUAL OF HYDRAULIC MINING. By T. F. Van Wagenen, E.M. New York: D. Van Nostrand.

A useful little handbook for practical miners having no knowledge of hydraulic engineering, describing the conditions and methods of placer mining, the properties of water, construction of water ways, flumes, ditches, piping, sluices, etc.

SILVER AND GOLD TABLES. New York: Mathey, Kustel & Riotte.

A series of tables showing the value of silver and gold per ounce troy at any degree of fineness. Also tables of weight, and tables for the calculation of assay values, as used by the New York metallurgical works.

THE AMERICAN SYSTEM—LATIN CHARTS WITH TEXT. By C. C. Schaeffer. Philadelphia: Charles Brothers & Co.

The first part of a series of text books on languages. The author holds that from ten to twelve hours' study of these charts will enable the student to "take up the text of Cæsar and Virgil so as to handle it with understanding." His English style is intensely German, and his work is as unintelligible as anything that has ever come to our table.

KREMER'S GRAPHIC RAILWAY GUIDE FOR GREAT BRITAIN AND THE CONTINENT. Price one shilling. Paris, London, and Nice.

Contains a large number of skeleton tours in Europe, with sketch maps, official time tables of railways, steamboats, etc., and a considerable amount of information of use to travelers.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) A. D. T. writes: We are lubricating our engine cylinder with winter strained lard oil. We wish to use the exhaust from engine. Can we, after condensing and cooling the water, float off the oil in the condensed water so it will not be tainted to the taste; or will we be compelled to filter the water? A. You can either filter the water, or exhaust through a coil, so that the oil carried over will not mix with the water. We think the latter is the better plan.

(2) C. M. R. asks how to keep moisture and ice in winter from forming and accumulating on plate glass store windows. The size of the glass is about 4x11½ feet. A. The only really successful method of accomplishing this is to place a row of very small gas jets at the base of the window near the glass.

(3) D. R. S. writes: 1. I wish a simple practical rule to determine the proper sizes to make foot wheel or band wheel of foot lathe (when the cones of lathe head are given), so that when the belt is changed it will be proper length on all of the sizes. A. If the two shafts are a good distance apart, it is sufficiently correct to make the sum of the diameters of the two opposite pulleys the same or a constant quantity. For a full explanation of the subject consult "Goodeve's Elements of Mechanism." 2. What is the best book or books published for a common scholar to complete the science of land surveying, as practiced by our ordinary surveyors? A. Write the industrial publishers who advertise in our columns.

(4) F. W. asks: Why is it that I can plainly see in the reflected image of Jupiter in a looking glass two of his moons, which I cannot see with the naked eye when looking at the planet without the aid of the looking glass? A. You do not see the moons of Jupiter as you imagine. The extra images are produced by the internal reflection of the planet in the body of the glass.

(5) R. H. G. asks: Can you give me through your paper a remedy for red ants? I have a house in which they fairly swarm, and cannot find anything that will drive them out. Have tried insect powder, bug poison, etc., without any good result. A. Turpentine or benzine used in small quantities is one of the best remedies, we believe. A good way to exterminate these pests is to place a sponge filled with water sweetened with molasses in the infested spot. It will soon become filled with the insects which may be killed with hot water. This operation repeated daily will soon accomplish the desired result.

(6) F. P. N. asks: What sort of lime is used in combination with flour for making moulds? A. Use good quicklime, a sufficient quantity to give the requisite hardness.

(7) H. A. asks: What is the highest incline a common locomotive can climb? A. A grade of 1 in 10, or 528 feet to the mile, is the heaviest grade ever worked by a locomotive having no artificial "grip" to the rail, but depending upon gravity for adhesion.

(8) H. H. McC. writes: In SCIENTIFIC AMERICAN of April 26, 1879, in an article on faience manufacture, on first page, it is stated Wedgwood was the first to discern that silex was bleached by calcination, and that calcined silex bleaches clay. Now, what I want to know is this: If clay bleaches oil, which it will, and silex bleaches clay, why will not silex bleach oil? Do you know if calcined silex contains any bleaching or decolorizing properties similar to animal charcoal? A. Try it. The bleaching action of such substances on oils is mechanical. They are not under the circumstances, bleaching agents in a chemical sense. 2. Can calcined silex be bought in the market? A. Yes. 3. Is it sometimes called hydrate silica? A. No 4. And if calcined, would it be more costly than animal charcoal? A. Weight for weight calcined silica is much cheaper. 5. How would you calcine it—that is, silex? A. Reduce it to powder and heat to bright redness in contact with air. 6. Sulphate of soda is used in making a soft quality of soap hard. Can you tell me what the proportions are to use it? A. 3 to 5 per cent of the calculated weight of alkali. 7. In the present volume of SCIENTIFIC AMERICAN, page 35, you speak of ice without freezing for skating rink, by mixture of chemicals. Could you give any instructions for making an experimental skating rink? A. Dissolve equal parts of carbonate and sulphate of soda in the smallest possible quantity of boiling water. The solution becomes solid by contact with cold air.

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(9) H. S. asks: 1. Please let me know through the SCIENTIFIC AMERICAN what mineral wax is used for and what is it worth? A. It is chiefly valued for the paraffine which it yields, and its value depends upon the percent of this substance which it contains Refined paraffine is quoted at 20 cents per lb. 2 and 3. And what does a machine for making pins cost? How many different sizes of machines are there in a pin factory? A. Address dealers in such machinery who advertise in the SCIENTIFIC AMERICAN. See Knight's New Mechanical Dictionary for descriptions, etc.

(10) A. P. R. asks: What is the horse power of a boiler of the following dimensions: fire box 4 feet long, 3½ feet wide, and 3½ feet high, with 113 tubes, 1¾ hole, and 11 feet 10 inches long? A. Your boiler is out of proportion, except for forced combustion; too little grate for the tube surface. It would be about 50 horse power.

(11) R. W. asks: 1. In making a cistern, is it necessary that the coat of cement should be permitted to get perfectly hard and dry before fitting the cistern? A. No, if the cement be a hydraulic cement. 2. If water be permitted to fill a cistern, with the cement still moist, will the water be pressed through the coat of cement, and thus spoil it; or will the cement grow hard and made a good cistern, notwithstanding the pressure of the water? A. Not if properly cemented. It will grow hard, but it is better to let it harden before the water is put in. 3. Can you give us the title of a book from which we could derive the necessary knowledge for building good cisterns? A. We know of no book which treats on the subject specially; "Beckwith's Hydraulic Lime and Teil" will give you general information respecting the use of hydraulic limes.

(12) C. O. S. asks how to soften sheet cork so as to make it pliable and easily shaped in an oval shape. A. Steam it thoroughly, or boil it in water for an hour or so.

(13) F. N. asks how to make a gas that will inflate small balloons in country towns where there is no ordinary burning gas. A. Place a quantity of zinc scraps in a bottle, pour over them a mixture of sulphuric acid and water, and hydrogen gas will be rapidly evolved. Convey this gas through a wash bottle to your balloon. This experiment should not be performed in the vicinity of a light or fire.

(14) G. A. H. asks: 1. What is the most constant galvanic battery now made; how long will it remain active by one charging; and how many cells are required of such to produce the electric light (moderately powerful)? A. The gravity or Daniell. They remain in order from 6 to 9 months. It would require 100 cells to produce a small light. 2. Why is graphite not suitable for the carbons? A. Because of its inferior conductivity. 3. Can mica be colored like stained glass, and if so, by what process? A. Apply lacquer tinted with aniline or other transparent colors.

(15) W. S. D. says: This morning, as engine 265 on the B. & O. R. R. was about five miles from here, the fireman went out on the front to put the head light out; but when he opened the door of the head light the wind seemed to fan the flame, and in an instant the whole thing was afire. He returned to the car for water, which seemed to have no effect on the burning oil. The engineer was compelled to stop his train and open his cocks on it after they had taken it down. A. The body of the oil in some way, doubtless, became heated above the inflaming point.

(16) E. S. asks: 1. What is the difference between a cape and a chipping chisel in shape and average width of cutting edge? A. A cape chisel is a narrow edged chisel, the cutting edge being from one-eighth inch to three-eighths inch wide. A chipping chisel is for work on surfaces, and is generally from three-quarters of an inch to one and a quarter inch wide. 2. Are cold chisels and chipping chisels the same, or is there a difference? A. Same thing. 3. What is a good width for the cutting edge of a scraper? A. Depends upon the kind of work. 4. Is ten or eleven feet per minute a proper speed for drilling wrought and cast iron, both of good quality? A. Ten to fifteen feet, depending upon the kind of drill and character of the metal.

(17) C. D. A. asks: 1. Is it of any advantage to an engine to reverse it every six months or year; that is, let it run six months in one direction, then six months in the other? A. It would equalize the wear. 2. How do you tell the condition of boiler iron with a hammer, or by giving it what is called the hammer test? A. By the sound. 3. Where, in Michigan, can an engineeer be examined to obtain a license? A. At Detroit, and, we believe, at Port Huron.

(18) "Student" asks: 1. If three pine logs, twenty-five feet long, fifteen inches diameter at small end, would have buoyant capacity enough to hold a boat's crew weighing about 700 lb.? A. Yes, if white pine. 2. Would one inch iron bolts be heavy enough to hold them together, if bolted to heavy cross pieces? A. Yes.

(19) P. J. M. asks: 1. What power is required to work a Cornish pump, 20 inch stroke, 8 inch discharge pipe, situated in a mine the shaft of which is 70 feet deep? A. If the pump makes 12 strokes per minute, 6 horse power, and for any other speed in proportion. 2. What power is requisite to hoist 800 lb. 70 feet per minute, that is from the same shaft? A. 17 horse power. To these powers should be added at least 25 per cent for friction. 3. What size engine and boiler would be required to perform both these duties at the same time? A. An engine of 30 horse power.

(20) D. H. writes: 1. I have a hull, 35 feet long, 10 feet beam, draws 36 inches. Now, what size engine do I need? A. Engine 8 inches diameter by 8 inch stroke. 2. What size propeller? A. Propeller 42 inches diameter.

(21) G. H. C. asks: If a vessel is filled with steam at 60 lb. pressure per square inch, then placed in a furnace of 1,000° temperature; supposing that the vessel is absolutely steam tight, will the pressure in vessel rise as the temperature rises, and what will be the pressure in said vessel per square inch when raised to 1,000°? A. Yes; it will increase in pressure about $\frac{1}{180}$ for every degree of increased temperature; in other words, an increase of 480 degrees would double the pressure.

(22) C. W. S. writes: I have a telephone line 1,200 feet long, and have for alarm vibrating bells to be worked by six cells of Leclanche battery. What are the proper connections and switches? I wish to use one wire, with ground connections at each end. A. To use a single wire for your purpose you will have to divide your battery and place three cells at each end of the line. For calling use at each end of the line a key that grounds the line when raised, and connects the line with the battery when depressed. Now, your bells being in the ground wire outside of the keys, pressing the key at one end of the line will ring the bell at the other end of the line, and *vice versa*. Connect your telephone with the ground wire, and arrange a switch that will cut the battery and bell out of the line, and at the same time direct the battery current to the transmitter, and the secondary current of the induction coil to the line. The receiving telephone should be connected with the secondary wire of the induction coil, between the latter and the switch which connects it with the line.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. S.—Galena—lead sulphide.—G. W. K.—Sulphide of iron.

COMMUNICATIONS RECEIVED.

On Science and Revelation. By P. S. H.
On Cause of Diseases. By L. H. K.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending October 12, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Air cooling apparatus, J. Chellew ... 233,072
Air engine, J. Ericsson (r) ... 9,414
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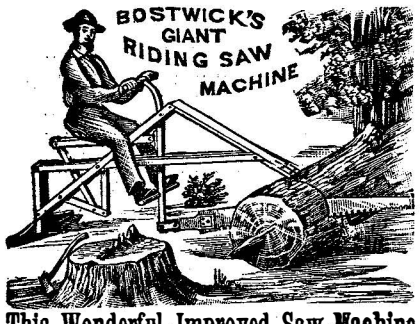

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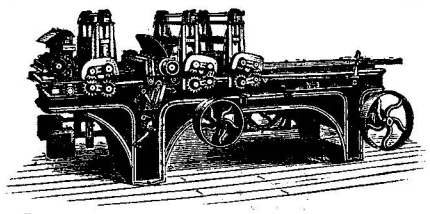

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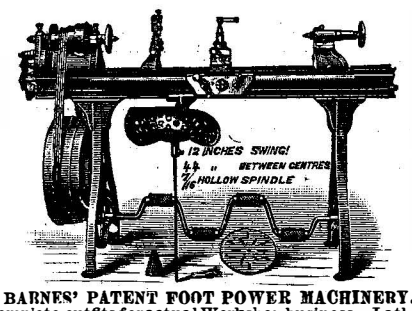

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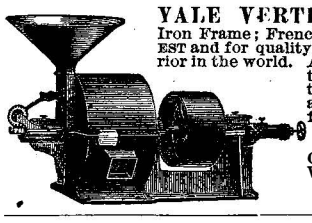

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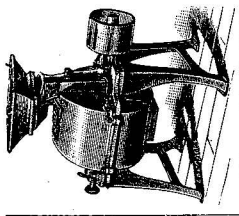

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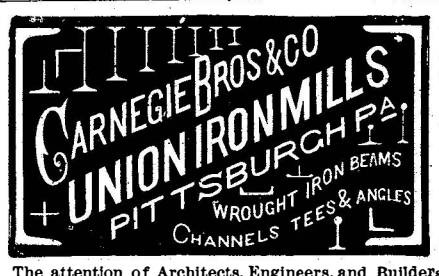

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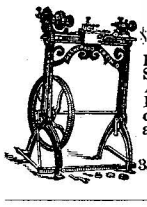

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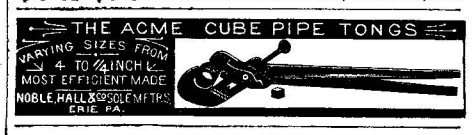

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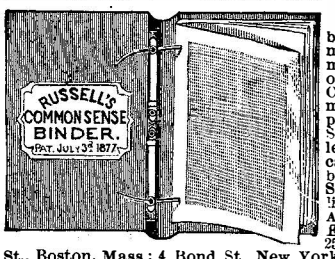

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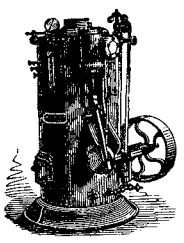

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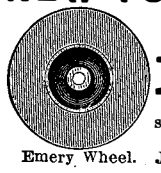

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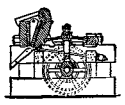

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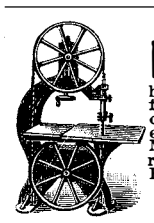

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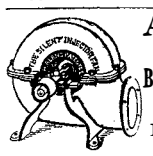

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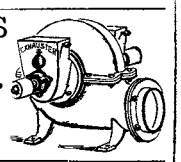

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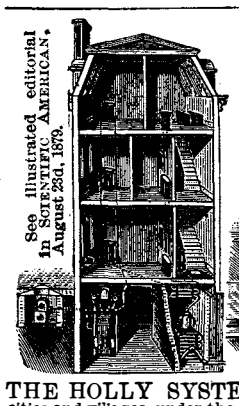

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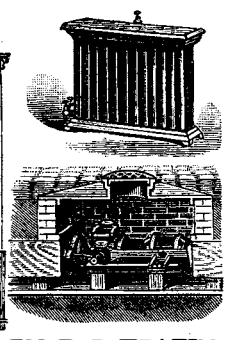

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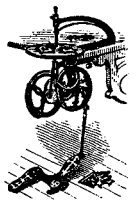

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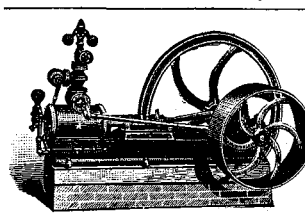

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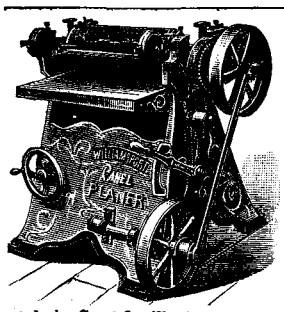

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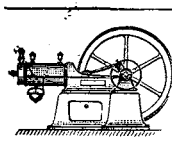

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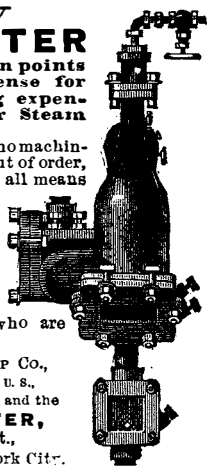

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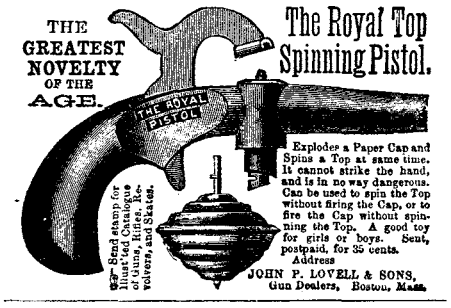

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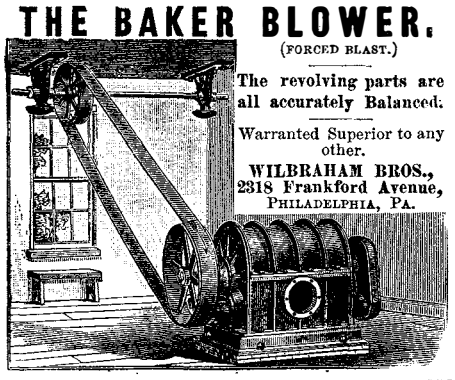

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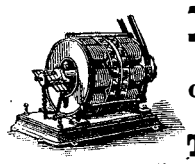

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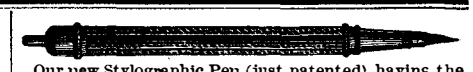

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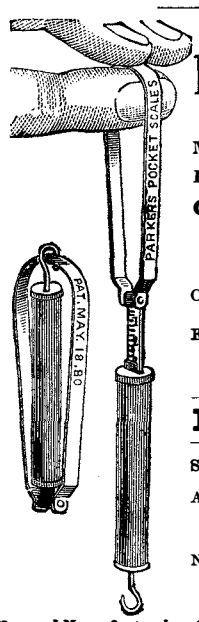

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